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project manual

North Syracuse Central School District
2023 Safety & Security Improvements

	SED No:
C-NS High School	42-03-03-06-0-016-036
North Syracuse Junior High	42-03-03-06-0-011-027
Gillette Road Middle School	42-03-03-06-0-012-021
Roxboro Road Middle School	42-03-03-06-0-010-022
Roxboro Road Elementary	42-03-03-06-0-008-019
Allen Road Elementary	42-03-03-06-0-001-023
Bear Road Elementary	42-03-03-06-0-002-017
Smith Road Elementary	42-03-03-06-0-009-017
District Office	42-03-03-06-1-007-014

project no. 23-44-7866 / 23-44-7868

volume 1 of 2

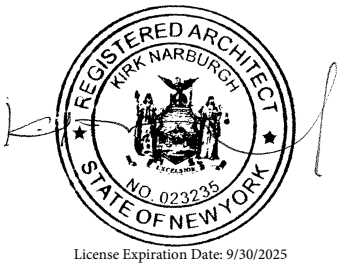
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Job No. 23-44-7866 / 23-44-7868

PROJECT MANUAL

North Syracuse Central School District
2023 Safety & Security Improvements

C-NS High School 42-03-03-06-0-016-036
N. Syracuse Junior High 42-03-03-06-0-011-027
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Bear Road Elementary 42-03-03-06-0-002-017
Smith Road Elementary 42-03-03-06-0-009-017
District Office 42-03-03-06-1-007-014



License Expiration Date: 9/30/2025

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License Expiration 5/31/2027

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To the best of our knowledge, information and belief, the plans and project manual are in accordance with applicable requirements of the New York State Uniform Fire Prevention and Building Code, the State Energy Conservation Construction Code, construction standards of the State Education Department, and, if applicable, the New York State Department of Labor Industrial Code Rule #56.

Date: February 09, 2024

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INDEX

PROJECT MANUAL FOR

PROJECT

North Syracuse Central School District
2023 Safety & Security Improvements

C-NS High School 42-03-03-06-0-016-036
N. Syracuse Junior High 42-03-03-06-0-011-027
Gillette Road Middle School 42-03-03-06-0-012-021
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Roxboro Road Elementary 42-03-03-06-0-008-019
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District Office 42-03-03-06-1-007-014

King + King Architects, LLP
358 West Jefferson Street
Syracuse, New York 13202

Date: February 09, 2024

SPECIFICATION INDEX

DIVISION 00 – BIDDING REQUIREMENTS

Sections
- Advertisement - Invitation to Bid
- Instructions to Bidders (AIA-A701-2018)
- Bid Forms:
  - Sitework
    General Construction
  - Plumbing
  - HVAC
  - Electrical
- Non-Collusive Bidding Certification (on Bid Form)
- Iran Divestment Certification (on Bid Form)
- Davis-Bacon Act Certification (on Bid Form)

DIVISION 00 – CONDITIONS AND CONTRACT FORMS

Sections
- General Conditions of the Contract (AIA-A232-2019)
- Supplementary General Conditions
- Form of Agreement (AIA-A132-2019)
- Supplementary Conditions to Form of Agreement
- Exhibit A (AIA-A132-2019)
- Selected AIA Contract Documents
- Performance and Payment Bond A311

Information Available to Bidders

DIVISION 01 – GENERAL REQUIREMENTS

Sections	010000	Labor Rates
	011100	Multiple Contract Summary
	012100	Allowances
	012200	Unit Prices
	012300	Alternates
	012500	Equivalency
	012900	Payment Procedures
	013200	Material and Equipment
	013300	Submittals
	013400	Construction Progress Schedule and Submittals
	014533	Special Inspection and Testing
	014533a	Statement of Special Inspection and Testing
	015000	Temporary Facilities and Controls
	016000	NYSED Uniform Safety Standards for School Construction
	017329	Cutting and Patching
	017419	Construction Waste Management and Disposal
	017700	Project Closeout
	019113	Commissioning Requirements

DIVISION 02 – EXISTING CONDITIONS

Sections	024119	Selective Demolition
	028200	Removal and Disposal of Asbestos
	028300	Removal and Handling of Lead-Based Paint

DIVISION 03 – CONCRETE

Section	030130.71	Rehabilitation of Cast-in-Place Concrete
	030130.72	Fiber-Reinforced Polymer Reinforcement of Concret
	033000	Cast-in-Place Concrete
	035416	Hydraulic Cement Underlayment

DIVISION 04 – MASONRY

Section	042000	Unit Masonry

DIVISION 05 – METALS

Sections	051200	Structural Steel Framing
	053100	Steel Decking
	054000	Cold-Formed Metal Framing
	055000	Metal Fabrications
	055213	Pipe and Tube Railings
	055300	Welded Steel Gratings

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

Section	061000	Rough Carpentry
	062013	Finish Carpentry
	064023	Interior Architectural Woodwork

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

Sections	070150	Re-Roofing Removals
	072100	Thermal Insulation
	072600	Vapor Retarders
	075419	KEE Roofing System
	077100	Roof Specialties
	077200	Roof Accessories
	078413	Penetration Firestopping
	078443	Joint Firestopping
	079100	Preformed Joint Seals
	079200	Joint Sealants

DIVISION 08 – OPENINGS

Sections	081416	Flush Wood Doors
	081600	FRP/Aluminum Hybrid Doors
	083300	Overhead Coiling Doors
	083313	Coiling Counter Shutters
	084113	Aluminum Framed Entrances and Storefronts
	084413	Glazed Aluminum Curtain Wall Systems
	085653	Security Windows
	087100	Door Hardware
	088000	Glazing
	088810	Fire Resistive Openings & Glazing

DIVISION 09 – FINISHES

Section	092116.23	Gypsum Board Shaftwall Assemblies
	092216	Non-Structural Metal Framing
	092900	Gypsum Board
	093013	Tiling
	095113	Acoustical Panel Ceilings
	096513	Resilient Base and Accessories
	096519	Resilient Tile Flooring
	096813	Tile Carpeting
	099123	Interior Painting
	099300	Staining and Transparent Finishing
	099600	High Performance Coatings

DIVISION 10 – SPECIALTIES

Sections	101423	Panel Signage

DIVISION 11 – EQUIPMENT

Section	112216.29	Package Transfer/Receiver Units

DIVISION 12 – FURNISHINGS

Section	122413	Roller Window Shades
	123216	Manufactured Plastic Laminate Casework
	123623	Plastic Laminate Clad Countertops
	123661.16	Solid Surfacing Countertops
	124813	Entry Floor Mats and Frames

DIVISION 21- FIRE SUPPRESSION

Not Used

DIVISION 22 – PLUMBING

Sections	220010	Basic Plumbing Requirements
	220502	Plumbing Piping Systems and Accessories
	220523	General Duty Valves for Plumbing Piping
	220553	Identification for Plumbing Piping and Equipment
	220580	Plumbing Pumps
	220700	Plumbing Insulation
	220901	Electric Wiring for Plumbing Systems
	221100	Facility Water Distribution
	221301	Facility Waste Water Systems

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

Sections	230010	Basic Mechanical Requirements
	230130	Mechanical Cleaning of HVAC Systems
	230509	Roof Curbs and Equipment Supports
	230513	Motors
	230514	Electric Wiring
	230519	Gauges and Thermometers
	230523	Valves
	230550	Wind Restraint for HVAC Systems
	230553	Mechanical Identification
	230593	Testing, Adjusting and Balancing
	230700	Insulation
	230923	Temperature Controls
	232000	Piping Systems and Accessories
	232023	Pumps
	232133	Water Systems Specialties
	233000	Sheetmetal and Ductwork Accessories
	233316	Fire Dampers
	233400	Fans
	233600	Variable and Constant Volume Terminal Units
	233713	Registers and Diffusers
	233726	Louvers and Penthouses
	234000	Air Filters and Accessories
	236423	Air Cooled Chiller w/Remote Evaporator
	237219	Energy Recovery Ventilator
	237313	Indoor Air Handling Units
	237413	Packaged Rooftop Unit
	238116	Split System Air Conditioner
	238210	Hydronic Gravity Heating Equipment
	238216 `	Coils
	238219	Fan Coil Units
	238230	Panel Radiation
	238239	Cabinet Unit Heaters

DIVISION 26 – ELECTRICAL

Sections	260010	Basic Electrical Requirements

	260100	Basic Materials and Methods
	260519	Low-Voltage Cables
	260526	Grounding
	260533	Raceways
	260543	Exterior Pathways
	260620	Wiring Devices
	260923	Wired Lighting Controls
	262213	Low Voltage Distribution Transformers
	262400	Switchboards and Panelboards
	262913	Switches, Contactors and Motor Controllers
	262923	Adjustable Speed Drives
	265100	Lighting
	265668	Exterior Athletic Lighting

DIVISION 27 – COMMUNICATIONS

Sections	271000	Horizontal and Backbone Communication Cabling
	271100	Communication Equipment Rooms and Spaces
	274117	Integrated Audio Systems
	275129	Emergency Communication System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

Sections	281619	Intrusion Detection System
	282319	High-Definition IP Video Surveillance
	283110	Fire Detection and Alarm System with Voice Evacuation

DIVISION 31 – EARTHWORK

Section	311201	Site Preparation
	312201	Site Earthwork
	312320	Building Earthwork
	312501	Erosion, Sediment, and Pollution Control

DIVISION 32 – EXTERIOR IMPROVEMENTS

Sections	321201	Asphalt Paving
	321301	Site Concrete Work
	321601	Granite Curb
	321800	Synthetic Turf
	323001	Athletic Equipment Furnishings
	323002	Metal Bollard
	323003	Aluminum Hand Railing
	323004	Steel Hand Railing
	323005	Scoreboard
	323006	Site Furnishings
	323007	Traffic Signs
	323008	Tension Net Backstop
	323100	Vinyl Clad Chain Link Fence, Gates, and Backstop

323101 Galvanized Chain Link Fence and Gates
323301 Modular Dugout
329201 Seeded Lawns
329202 Vegetated Ground Cover

DIVISION 33 – UTILITIES
Sections 331101 Water Distribution
331102 Disinfection of Water System
334001 Storm Drainage

DRAWING INDEX

VOLUME 1

COVERPAGE

A - CICERO NORTH SYRACUSE HIGH SCHOOL

SITE
A L0.00 SITE IMPROVEMENT PLAN A and B

ARCHITECTURAL
A A0.00 LEGEND, SYMBOLS AND DETAILS
A A1.01 COMPREHENSIVE LOWER LEVEL PLAN
A A1.02 COMPREHENSIVE MAIN FLOOR PLAN
A A1.03 COMPREHENSIVE SECOND FLOOR PLAN
A A1.04 COMPREHENSIVE THIRD FLOOR PLAN
A A4.01 STAIR PLANS, ELEVATIONS, AND DETAILS
A A4.02 ENLARGED FLOOR PLANS, ELEVATIONS & DETAILS AT SECURE VESTIBULE
A A4.03 CONSTRUCTION PLANS AND DETAILS - POOL BASEMENT AND FIRST FLOOR
A A4.04 INTERIOR ELEVATIONS - POOL AREA
A A4.05 INTERIOR ELEVATIONS AND DETAILS - POOL AREA
A A4.06 INTERIOR ELEVATIONS, DETAILS AND FINISH SCHEDULE – POOL AREA
A A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES & DETAILS
A A5.02 CURTAIN WALL TYPES & DETAILS

STRUCTURAL
A S1.01 ENTRY STAIR PLANS AND DETAILS

ELECTRICAL
A E0.00 GENERAL NOTES AND LEGENDS- ELECTRICAL
A E0.01 HIGH SCHOOL OVERALL ELECTRICAL PLANS
A E0.02 PARTIAL BASEMENT PLAN AREA A - ELECTRICAL DEMOLITION
A E0.03 PARTIAL BASEMENT PLAN AREA B - ELECTRICAL DEMOLITION
A E0.04 PARTIAL BASEMENT PLAN AREA C - ELECTRICAL DEMOLITION
A E0.05 PARTIAL BASEMENT PLAN AREA D - ELECTRICAL DEMOLITION
A E0.06 PARTIAL BASEMENT PLAN AREA E - ELECTRICAL DEMOLITION
A E0.07 PARTIAL BASEMENT PLAN AREA F - ELECTRICAL DEMOLITION
A E0.08 PARTIAL FIRST FLOOR PLAN AREA A - ELECTRICAL DEMOLITION
A E0.09 PARTIAL FIRST FLOOR PLAN AREA B - ELECTRICAL DEMOLITION
A E0.10 PARTIAL FIRST FLOOR PLAN AREA C - ELECTRICAL DEMOLITION
A E0.11 PARTIAL FIRST FLOOR PLAN AREA D - ELECTRICAL DEMOLITION
A E0.12 PARTIAL FIRST FLOOR PLAN AREA E - ELECTRICAL DEMOLITION
A E0.13 PARTIAL FIRST FLOOR PLAN AREA F - ELECTRICAL DEMOLITION
A E0.14 PARTIAL SECOND FLOOR PLAN AREA A - ELECTRICAL DEMOLITION
A E0.15 PARTIAL SECOND FLOOR PLAN AREA B - ELECTRICAL DEMOLITION
A E0.16 PARTIAL SECOND FLOOR PLAN AREA C - ELECTRICAL DEMOLITION
A E0.17 PARTIAL SECOND FLOOR PLAN AREA D - ELECTRICAL DEMOLITION
A E0.18 PARTIAL THIRD FLOOR PLAN AREA A - ELECTRICAL DEMOLITION

A E0.19 ROOF PLAN - ELECTRICAL DEMOLITION
A E1.01 PARTIAL BASEMENT PLAN AREA A - POWER AND SYSTEMS
A E1.02 PARTIAL BASEMENT PLAN AREA B- POWER AND SYSTEMS
A E1.03 PARTIAL BASEMENT PLAN AREA C - POWER AND SYSTEMS
A E1.04 PARTIAL BASEMENT PLAN AREA D - POWER AND SYSTEMS
A E1.05 PARTIAL BASEMENT PLAN AREA E - POWER AND SYSTEMS
A E1.06 PARTIAL BASEMENT PLAN AREA F - POWER AND SYSTEMS
A E1.08 PARTIAL FIRST FLOOR PLAN AREA A - POWER AND SYSTEMS
A E1.09 PARTIAL FIRST FLOOR PLAN AREA B - POWER AND SYSTEMS
A E1.10 PARTIAL FIRST FLOOR PLAN AREA C - POWER AND SYSTEMS
A E1.11 PARTIAL FIRST FLOOR PLAN AREA D - POWER AND SYSTEMS
A E1.12 PARTIAL FIRST FLOOR PLAN AREA E - POWER AND SYSTEMS
A E1.13 PARTIAL FIRST FLOOR PLAN AREA F - POWER AND SYSTEMS
A E1.15 PARTIAL SECOND FLOOR PLAN AREA A - POWER AND SYSTEMS
A E1.16 PARTIAL SECOND FLOOR PLAN AREA B - POWER AND SYSTEMS
A E1.17 PARTIAL SECOND FLOOR PLAN AREA C - POWER AND SYSTEMS
A E1.18 PARTIAL SECOND FLOOR PLAN AREA D - POWER AND SYSTEMS
A E1.20 PARTIAL THIRD FLOOR PLAN AREA A - POWER AND SYSTEMS
A E1.21 ROOF PLAN - POWER AND SYSTEMS
A E5.01 ELECTRICAL RISERS

B - NORTH SYRACUSE JUNIOR HIGH SCHOOL

SITE
B L0.00 WORK AREA PLAN
B L1.00 SITE IMPROVEMENT PLAN A
B L1.01 SITE IMPROVEMENT PLAN B and PLAN C
B L1.02 SITE IMPROVEMENT PLAN D

ENVIRONMENTAL
B X0.01 ASBESTOS REMOVAL PARTIAL FIRST FLOOR PLAN

ARCHITECTURAL
B A1.01 COMPREHENSIVE BASEMENT FLOOR PLAN
B A1.02 COMPREHENSIVE FIRST FLOOR PLAN
B A1.03 COMPREHENSIVE SECOND FLOOR PLAN
B A1.04 COMPREHENSIVE THIRD FLOOR PLAN
B A3.01 WALL SECTIONS & SECTION DETAILS
B A4.01 VESTIBULE RENOVATION DETAILS
B A5.01 DOOR & WINDOW SCHEDULES & DETAILS
B A5.02 DOOR, WINDOW & STOREFRONT FRAME TYPES
B A5.03 DOOR, WINDOW & STOREFRONT FRAME TYPES
B A5.04 DOOR FRAME DETAILS

STRUCTURAL
B S1.01 VESTIBULE OPENING REINFORCING

HVAC
B H0.00 GENERAL NOTES, LEGENDS AND OVERAL PLANS - HVAC
B H4.01 PARTIAL BASEMENT AND FIRST FLOOR PLAN - AREA B -DUCTWORK
B H4.02 PARTIAL BASEMENT AND FIRST FLOOR PLAN - AREA B - PIPING

B H5.01 SCHEDULES, CONTROLS SCHEMATICS AND DETAILS – HVAC

ELECTRICAL
B E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
B E0.01 JUNIOR HIGH SCHOOL OVERALL ELECTRICAL PLANS
B E0.02 PARTIAL BASEMENT PLAN AREA A - ELECTRICAL DEMOLITION
B E0.03 PARTIAL BASEMENT PLAN AREA B - ELECTRICAL DEMOLITION
B E0.04 PARTIAL BASEMENT PLAN AREA C - ELECTRICAL DEMOLITION
B E0.05 PARTIAL BASEMENT PLAN AREA D - ELECTRICAL DEMOLITION
B E0.06 PARTIAL FIRST FLOOR AREA A - ELECTRICAL DEMOLITION
B E0.07 PARTIAL FIRST FLOOR AREA B - ELECTRICAL DEMOLITION
B E0.08 PARTIAL FIRST FLOOR AREA C - ELECTRICAL DEMOLITION
B E0.09 PARTIAL FIRST FLOOR AREA D - ELECTRICAL DEMOLITION
B E0.10 PARTIAL FIRST FLOOR AREA E - ELECTRICAL DEMOLITION
B E0.11 PARTIAL SECOND FLOOR AREA A - ELECTRICAL DEMOLITION
B E0.12 PARTIAL SECOND FLOOR AREA B - ELECTRICAL DEMOLITION
B E0.13 PARTIAL SECOND FLOOR AREA C - ELECTRICAL DEMOLITION
B E0.15 PARTIAL SECOND FLOOR AREA E - ELECTRICAL DEMOLITION
B E0.16 PARTIAL THIRD FLOOR AREA A - ELECTRICAL DEMOLITION
B E0.18 PARTIAL THIRD FLOOR AREA B - ELECTRICAL DEMOLITION
B E0.19 PARTIAL THIRD FLOOR AREA C - ELECTRICAL DEMOLITION
B E1.02 PARTIAL BASEMENT AREA A - POWER AND SYSTEMS
B E1.03 PARTIAL BASEMENT AREA B - POWER AND SYSTEMS
B E1.04 PARTIAL BASEMENT AREA C - POWER AND SYSTEMS
B E1.05 PARTIAL BASEMENT AREA D - POWER AND SYSTEMS
B E1.06 PARTIAL FIRST FLOOR AREA A - POWER AND SYSTEMS
B E1.07 PARTIAL FIRST FLOOR AREA B - POWER AND SYSTEMS
B E1.08 PARTIAL FIRST FLOOR AREA C - POWER AND SYSTEMS
B E1.09 PARTIAL FIRST FLOOR AREA D - POWER AND SYSTEMS
B E1.10 PARTIAL FIRST FLOOR AREA E - POWER AND SYSTEMS
B E1.11 PARTIAL SECOND FLOOR AREA A - POWER AND SYSTEMS
B E1.12 PARTIAL SECOND FLOOR AREA B - POWER AND SYSTEMS
B E1.13 PARTIAL SECOND FLOOR AREA C - POWER AND SYSTEMS
B E1.15 PARTIAL SECOND FLOOR AREA E - POWER AND SYSTEMS
B E1.16 PARTIAL THIRD FLOOR AREA A - POWER AND SYSTEMS
B E1.17 PARTIAL THIRD FLOOR AREA B - POWER AND SYSTEMS
B E1.18 PARTIAL THIRD FLOOR AREA C - POWER AND SYSTEMS
B E1.19 FOURTH FLOOR ELECTRICAL - AREA A
B E3.01 ENLARGED SECURE VESTIBULE - ELECTRICAL DEMOLITION AND NEW WORK PLANS
B E5.01 EMERGENCY COMMUNICATIONS RISER
B E5.02 EM FIRE ALARM RISERS
B E6.00 ELECTRICAL SCHEDULES
B E6.01 ELECTRICAL SCHEDULES

VOLUME 2

COVERPAGE

C - GILLETTE ROAD MIDDLE SCHOOL

SITE

C L0.00 SITE SURVEY
C L0.01 SITE NOTES
C L0.02 SITE PREPARARTION PLAN A
C L0.03 SITE PREPARARTION PLAN B
C L0.04 SITE PREPARARTION PLAN C
C L0.05 STORMWATER POLLUTION PREVENTION PLAN
C L0.06 SWPPP NOTES
C L1.00 GRADING PLAN A
C L1.01 GRADING PLAN B
C L1.02 GRADING PLAN C
C L1.03 DRAINAGE AND UTILITY PLAN A
C L1.04 DRAINAGE AND UTILITY PLAN B
C L1.05 DRAINAGE AND UTILITY PLAN C
C L1.06 LAYOUT PLAN A
C L1.07 LAYOUT PLAN B
C L1.08 LAYOUT PLAN C
C L1.09 SITE IMPROVEMENT PLAN
C L9.00 DETAILS
C L9.01 DETAILS
C L9.02 DETAILS - ATHLETIC FIELD
C L9.03 DETAILS - ATHLETIC FIELD
C L9.04 DETAILS - ATHLETIC FIELD
C L9.05 DETAILS - ATHLETIC FIELD

ENVIRONMENTAL

C X0.01 BASEMENT LEVEL ASBESTOS REMOVAL PLAN
C X0.02 FIRST FLOOR ASBESTOS REMOVAL PLAN

ARCHITECTURAL

C A0.00 LEGEND, SYMBOLS AND DETAILS
C G0.00 COMPREHENSIVE BASEMENT FLOOR PLAN
C G0.01 COMPREHENSIVE FIRST FLOOR PLAN
C G0.02 COMPREHENSIVE SECOND FLOOR PLAN
C A0.01 DEMOLITION PLAN - FIRST FLOOR - AREA A
C A0.02 DEMOLITION PLAN - FIRST FLOOR - AREA B
C A0.03 DEMOLITION PLAN - FIRST FLOOR - AREA C
C A0.04 DEMOLITION PLAN - FIRST FLOOR - AREA D
C A0.05 DEMOLITION PLAN - FIRST FLOOR - AREAS E & F
C A0.06 DEMOLITION PLAN - SECOND FLOOR - AREA D
C A0.07 DEMOLITION PLAN - SECOND FLOOR - AREA E
C A1.00 CONSTRUCTION PLAN - CRAWL SPACE - AREAS B & E
C A1.01 CONSTRUCTION PLAN - FIRST FLOOR - AREA A
C A1.02 CONSTRUCTION PLAN - FIRST FLOOR - AREA B
C A1.03 CONSTRUCTION PLAN - FIRST FLOOR - AREA C

C A1.04 CONSTRUCTION PLAN - FIRST FLOOR - AREA D
C A1.05 CONSTRUCTION PLAN - FIRST FLOOR - AREAS E & F
C A1.06 CONSTRUCTION PLAN - SECOND FLOOR - AREA D
C A1.07 CONSTRUCTION PLAN - SECOND FLOOR - AREA E
C A1.08 OVERALL ROOF PLAN
C A1.09 PARTIAL ROOF PLAN - AREA D
C A1.10 ROOF DETAILS
C A1.11 ROOF DETAILS
C A2.01 REFLECTED CEILING PLAN - FIRST FLOOR - AREA A
C A2.02 REFLECTED CEILING PLAN - FIRST FLOOR - AREA B
C A2.03 REFLECTED CEILING PLAN - FIRST FLOOR - AREA C
C A2.04 REFLECTED CEILING PLAN - FIRST FLOOR - AREA D
C A2.05 REFLECTED CEILING PLAN - FIRST FLOOR - AREAS E & F
C A2.06 REFLECTED CEILING PLAN - SECOND FLOOR - AREA D
C A2.07 REFLECTED CEILING PLAN - SECOND FLOOR - AREA E
C A4.02 INTERIOR ELEVATIONS
C A4.03 INTERIOR ELEVATIONS
C A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES, & DETAILS
C A5.02 CASEWORK SCHEDULE & DETAILS

STRUCTURAL
C S0.00 GENERAL NOTES, ABBREVIATIONS, AND COMPONENTS & CLADDING
C S1.01 CONSTRUCTION PLAN - FOUNDATION PLAN - AREA B & C
C S1.02 CONSTRUCTION PLAN - FOUNDATION PLAN - AREA E
C S1.03 CONSTRUCTION PLAN - FIRST FLOOR FRAMING - AREA B & C
C S1.04 CONSTRUCTION PLAN - FIRST FLOOR AND AREAWAYS - AREA C & E
C S1.05 CONSTRUCTION PLAN - SECOND FLOR - AREA E
C S1.06 CONSTRUCTION PLAN - ROOF FRAMING PLAN - AREA A
C S1.07 CONSTRUCTION PLAN - ROOF FRAMING - AREA B
C S1.08 CONSTRUCTION PLAN - ROOF FRAMING - AREA C
C S1.09 CONSTRUCTION PLAN - ROOF FRAMING - AREA D
C S1.10 CONSTRUCTION PLAN - ROOF FRAMING - AREA E & F
C S9.01 TYPICAL DETAILS
C S9.02 TYPICAL DETAILS
C S9.03 TYPICAL DETAILS

PLUMBING
C P0.00 LEGENDS, GENERAL NOTES AND DETAILS - PLUMBING
C P0.01 PARTIAL FIRST FLOOR PLAN - AREA B - PLUMBING DEMOLITION
C P0.02 PARTIAL FIRST FLOOR PLAN - AREA C AND D - PLUMBING DEMOLITION
C P1.01 PARTIAL BASEMENT PLAN - AREA B - PLUMBING
C P1.02 PARTIAL BASEMENT PLAN - AREA C - PLUMBING
C P1.03 PARTIAL BASEMENT PLAN - AREA E - PLUMBING
C P1.04 PARTIAL FIRST FLOOR PLAN - AREA B - PLUMBING
C P1.05 PARTIAL FIRST FLOOR PLAN - AREA D - PLUMBING
C P1.06 PARTIAL FIRST FLOOR AND SECOND PLAN - AREA E – PLUMBING

VOLUME 3

COVERPAGE

C - GILLETTE ROAD MIDDLE SCHOOL – CONTINUED

HVAC

C H0.00 GENERAL NOTES AND LEGENDS - HVAC
C H0.01 PARTIAL BASEMENT PLAN - AREA A - DUCTWORK DEMOLITION
C H0.02 PARTIAL BASEMENT PLAN - AREA B - DUCTWORK DEMOLITION
C H0.03 PARTIAL BASEMENT PLAN - AREA C - DUCTWORK DEMOLITION
C H0.04 PARTIAL BASEMENT PLAN - AREA D - DUCTWORK DEMOLITION
C H0.05 PARTIAL BASEMENT PLAN - AREA E - DUCTWORK DEMOLITION
C H0.06 PARTIAL FIRST FLOOR PLAN - AREA A - DUCTWORK DEMOLITION
C H0.07 PARTIAL FIRST FLOOR PLAN - AREA B - DUCTWORK DEMOLITION
C H0.08 PARTIAL FIRST FLOOR PLAN - AREA C - DUCTWORK DEMOLITION
C H0.09 PARTIAL FIRST FLOOR PLAN - AREA D - DUCTWORK DEMOLITION
C H0.10 PARTIAL FIRST FLOOR PLAN - AREA E - DUCTWORK DEMOLITION
C H0.11 PARTIAL FIRST FLOOR PLAN - AREA F - DUCTWORK DEMOLITION
C H0.12 PARTIAL SECOND FLOOR PLAN - AREA D - DUCTWORK DEMOLITION
C H0.13 PARTIAL SECOND FLOOR PLAN - AREA E - DUCTWORK DEMOLITION
C H0.14 PARTIAL SECOND FLOOR PLAN - AREA F - DUCTWORK DEMOLITION
C H0.15 PARTIAL BASEMENT PLAN - AREA A - PIPING DEMOLITION
C H0.16 PARTIAL BASEMENT PLAN - AREA B - PIPING DEMOLITION
C H0.17 PARTIAL BASEMENT PLAN - AREA C - PIPING DEMOLITION
C H0.18 PARTIAL BASEMENT PLAN - AREA D - PIPING DEMOLITION
C H0.19 PARTIAL BASEMENT PLAN - AREA E - PIPING DEMOLITION
C H0.20 PARTIAL FIRST FLOOR PLAN - AREA A - PIPING DEMOLITION
C H0.21 PARTIAL FIRST FLOOR PLAN - AREA B - PIPING DEMOLITION
C H0.22 PARTIAL FIRST FLOOR PLAN - AREA C - PIPING DEMOLITION
C H0.23 PARTIAL FIRST FLOOR PLAN - AREA D - PIPING DEMOLITION
C H0.24 PARTIAL FIRST FLOOR PLAN - AREA E - PIPING DEMOLITION
C H0.25 PARTIAL FIRST FLOOR PLAN - AREA F - PIPING DEMOLITION
C H0.26 PARTIAL SECOND FLOOR PLAN - AREA D - PIPING DEMOLITION
C H0.27 PARTIAL SECOND FLOOR PLAN - AREA E - PIPING DEMOLITION
C H0.28 PARTIAL SECOND FLOOR PLAN - AREA F - PIPING DEMOLITION
C H0.29 ROOF PLAN - HVAC DEMOLITION
C H1.01 PARTIAL BASEMENT PLAN - AREA A - DUCTWORK
C H1.02 PARTIAL BASEMENT PLAN - AREA B - DUCTWORK
C H1.03 PARTIAL BASEMENT PLAN - AREA C - DUCTWORK
C H1.04 PARTIAL BASEMENT PLAN - AREA D - DUCTWORK
C H1.05 PARTIAL BASEMENT PLAN - AREA E - DUCTWORK
C H1.06 PARTIAL FIRST FLOOR PLAN - AREA A - DUCTWORK
C H1.07 PARTIAL FIRST FLOOR PLAN - AREA B - DUCTWORK
C H1.08 PARTIAL FIRST FLOOR PLAN - AREA C - DUCTWORK
C H1.09 PARTIAL FIRST FLOOR PLAN - AREA D - DUCTWORK
C H1.10 PARTIAL FIRST FLOOR PLAN - AREA E - DUCTWORK
C H1.11 PARTIAL FIRST FLOOR PLAN - AREA F - DUCTWORK
C H1.12 PARTIAL SECOND FLOOR PLAN - AREA D - DUCTWORK
C H1.13 PARTIAL SECOND FLOOR PLAN - AREA E - DUCTWORK
C H1.14 PARTIAL SECOND FLOOR PLAN - AREA F - DUCTWORK

C H2.01 PARTIAL BASEMENT PLAN - AREA A - PIPING
C H2.02 PARTIAL BASEMENT PLAN - AREA B - PIPING
C H2.03 PARTIAL BASEMENT PLAN - AREA C - PIPING
C H2.04 PARTIAL BASEMENT PLAN - AREA D - PIPING
C H2.05 PARTIAL BASEMENT PLAN - AREA E - PIPING
C H2.06 PARTIAL FIRST FLOOR PLAN - AREA A - PIPING
C H2.07 PARTIAL FIRST FLOOR PLAN - AREA B - PIPING
C H2.08 PARTIAL FIRST FLOOR PLAN - AREA C - PIPING
C H2.09 PARTIAL FIRST FLOOR PLAN - AREA D - PIPING
C H2.10 PARTIAL FIRST FLOOR PLAN - AREA E - PIPING
C H2.11 PARTIAL FIRST FLOOR PLAN - AREA F - PIPING
C H2.12 PARTIAL SECOND FLOOR PLAN - AREA D - PIPING
C H2.13 PARTIAL SECOND FLOOR PLAN - AREA E - PIPING
C H2.14 PARTIAL SECOND FLOOR PLAN - AREA F - PIPING
C H2.15 ROOF PLAN - HVAC
C H3.01 HVAC SECTIONS
C H4.01 HVAC ENLARGED VIEWS - DEMOLITION
C H4.02 HVAC ENLARGED VIEWS
C H4.03 ENLARGED EVAPORATOR ROOM PLAN - AREA C - HVAC
C H5.01 HVAC CONTROLS
C H5.02 HVAC CONTROLS
C H5.03 HVAC CONTROLS
C H5.04 HVAC CONTROLS
C H5.05 HVAC CONTROLS
C H5.06 HVAC CONTROLS
C H6.01 HVAC SCHEDULES
C H6.02 HVAC SCHEDULES
C H6.03 HVAC SCHEDULES
C H6.04 HVAC SCHEDULES
C H7.01 BASEMENT ELEVATION PLANS - AREAS A, B, AND C
C H7.02 BASEMENT ELEVATION PLANS - AREA E
C H8.01 HOT WATER SYSTEM SCHEMATIC - DEMOLITION
C H8.02 HOT WATER SYSTEM SCHEMATIC
C H8.03 CHILLED WATER SYSTEM
C H9.01 HVAC DETAILS
C H9.02 HVAC DETAILS
C H9.03 AIR HANDLING UNIT CONFIGURATION DETAILS

ELECTRICAL
C E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
C E0.01 PARTIAL SITE PLAN - ATHLETIC FIELD 1 - ELECTRICAL DEMOLITION
C E0.02 PARTIAL SITE PLAN - ATHLETIC FIELD 1 - ELECTRICAL
C E0.03 PARTIAL SITE PLAN - PARKING LOT ELECTRICAL DEMOLITION
C E0.04 PARTIAL SITE PLAN - PARKING LOT LIGHTING
C E0.05 PARTIAL BASEMENT PLAN - AREA A ELECTRICAL DEMOLITION
C E0.06 PARTIAL BASEMENT PLAN - AREA B - ELECTRICAL DEMOLITION
C E0.07 PARTIAL BASEMENT PLAN - AREA C - ELECTRICAL DEMOLITION
C E0.09 PARTIAL BASEMENT PLAN - AREA E - ELECTRICAL DEMOLITION
C E0.10 PARTIAL BASEMENT PLAN - AREA F - ELECTRICAL DEMOLITION
C E0.11 PARTIAL FIRST FLOOR PLAN - AREA A - ELECTRICAL DEMOLITION
C E0.12 PARTIAL FIRST FLOOR PLAN - AREA B - ELECTRICAL DEMOLITION

C E0.13	PARTIAL FIRST FLOOR PLAN - AREA C - ELECTRICAL DEMOLITION
C E0.14	PARTIAL FIRST FLOOR PLAN - AREA D - ELECTRICAL DEMOLITION
C E0.15	PARTIAL FIRST FLOOR PLAN - AREA E - ELECTRICAL DEMOLITION
C E0.16	PARTIAL FIRST FLOOR PLAN - AREA F - ELECTRICAL DEMOLITION
C E0.17	PARTIAL SECOND FLOOR PLAN - AREA D - ELECTRICAL DEMOLITION
C E0.18	PARTIAL SECOND FLOOR PLAN - AREA E - ELECTRICAL DEMOLITION
C E0.19	PARTIAL SECOND FLOOR PLAN - AREA F - ELECTRICAL DEMOLITION
C E0.20	ROOF PLAN - ELECTRICAL DEMOLITION
C E1.00	PARTIAL BASEMENT PLAN - AREA A - POWER AND SYSTEMS
C E1.01	PARTIAL BASEMENT PLAN - AREA B - POWER AND SYSTEMS
C E1.02	PARTIAL BASEMENT PLAN - AREA C - POWER AND SYSTEMS
C E1.03	PARTIAL BASEMENT PLAN - AREA D - POWER AND SYSTEMS
C E1.04	PARTIAL BASEMENT PLAN - AREA E - POWER AND SYSTEMS
C E1.05	PARTIAL BASEMENT PLAN - AREA F - POWER AND SYSTEMS
C E1.06	PARTIAL FIRST FLOOR PLAN - AREA A - POWER AND SYSTEMS
C E1.07	PARTIAL FIRST FLOOR PLAN - AREA B - POWER AND SYSTEMS
C E1.08	PARTIAL FIRST FLOOR PLAN - AREA C - POWER AND SYSTEMS
C E1.09	PARTIAL FIRST FLOOR PLAN - AREA D - POWER AND SYSTEMS
C E1.10	PARTIAL FIRST FLOOR PLAN - AREA E - POWER AND SYSTEMS
C E1.11	PARTIAL FIRST FLOOR PLAN - AREA F - POWER AND SYSTEMS
C E1.12	PARTIAL SECOND FLOOR PLAN - AREA D - POWER AND SYSTEMS
C E1.13	PARTIAL SECOND FLOOR PLAN - AREA E - POWER AND SYSTEMS
C E1.14	PARTIAL SECOND FLOOR PLAN - AREA F - POWER AND SYSTEMS
C E1.15	ROOF PLAN - POWER AND SYSTEMS
C E2.01	PARTIAL FIRST FLOOR PLAN - AREA A - LIGHTING
C E2.02	PARTIAL FIRST FLOOR PLAN - AREA B - LIGHTING
C E2.03	PARTIAL FIRST FLOOR PLAN - AREA C - LIGHTING
C E2.04	PARTIAL FIRST FLOOR PLAN - AREA D - LIGHTING
C E2.05	PARTIAL FIRST FLOOR PLAN - AREA E - LIGHTING
C E2.06	PARTIAL FIRST FLOOR PLAN - AREA F - LIGHTING
C E2.07	PARTIAL SECOND FLOOR PLAN - AREA D - LIGHTING
C E2.08	PARTIAL SECOND FLOOR PLAN - AREA E - LIGHTING
C E4.00	SECURE VESTIBULE PLAN - ELECTRICAL DEMOLITION AND NEW WORK
C E5.00	ONE LINE DIAGRAM - DEMOLITION
C E5.01	ONE LINE DIAGRAM
C E5.02	ONE LINE DIAGRAM ATHLETIC FIELD
C E5.03	FIRE ALARM AND EMERGENCY COMMUNICATION RISER DIAGRAM
C E5.04	TELECOM RISER AND RACK ELEVATIONS
C E5.05	EXTERIOR SOUND SYSTEM RISER DIAGRAM
C E6.00	ELECTRICAL SCHEDULES
C E6.01	ELECTRICAL SCHEDULES
C E6.02	ELECTRICAL SCHEDULES
C E6.03	ELECTRICAL SCHEDULES
C E9.00	ELECTRICAL DETAILS
C E9.01	ELECTRICAL DETAILS
C E9.02	ELECTRICAL DETAILS

VOLUME 4

COVERPAGE

D - ROXBORO MIDDLE SCHOOL

ARCHITECTURAL
A0.00 LEGEND, SYMBOLS AND DETAILS
D A1.01 COMPREHENSIVE GROUND FLOOR PLAN
D A1.02 COMPREHENSIVE FIRST FLOOR PLAN
D A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES & DETAILS
D A5.02 DOOR SCHEDULES, SECURITY WINDOW SECTIONS & DETAILS,AND FINISH

ELECTRICAL
D E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
D E0.01 ROXBORO MIDDLE SCHOOL OVERALL ELECTRICAL PLANS
D E0.02 PARTIAL BASEMENT AREA A - ELECTRICAL DEMOLITION
D E0.03 PARTIAL BASEMENT AREA B - ELECTRICAL DEMOLITION
D E0.04 PARTIAL BASEMENT AREA C - ELECTRICAL DEMOLITION
D E0.05 PARTIAL BASEMENT AREA D - ELECTRICAL DEMOLITION
D E0.06 PARTIAL BASEMENT AREA E - ELECTRICAL DEMOLITION
D E0.07 PARTIAL FIRST FLOOR AREA A - ELECTRICAL DEMOLITION
D E0.08 PARTIAL FIRST FLOOR AREA B - ELECTRICAL DEMOLITION
D E0.09 PARTIAL FIRST FLOOR AREA C - ELECTRICAL DEMOLITION
D E0.10 PARTIAL FIRST FLOOR AREA D - ELECTRICAL DEMOLITION
D E0.11 PARTIAL FIRST FLOOR AREA E - ELECTRICAL DEMOLITION
D E0.12 ROOF PLAN - ELECTRICAL DEMOLITION
D E1.00 PARTIAL BASEMENT AREA A - POWER AND SYSTEMS
D E1.01 PARTIAL BASEMENT AREA B - POWER AND SYSTEMS
D E1.02 PARTIAL BASEMENT AREA C - POWER AND SYSTEMS
D E1.03 PARTIAL BASEMENT AREA D - POWER AND SYSTEMS
D E1.04 PARTIAL BASEMENT AREA E - POWER AND SYSTEMS
D E1.05 PARTIAL FIRST FLOOR AREA A - POWER AND SYSTEMS
D E1.06 PARTIAL FIRST FLOOR AREA B - POWER AND SYSTEMS
D E1.07 PARTIAL FIRST FLOOR AREA C - POWER AND SYSTEMS
D E1.08 PARTIAL FIRST FLOOR AREA D - POWER AND SYSTEMS
D E1.09 PARTIAL FIRST FLOOR AREA E - POWER AND SYSTEMS
D E1.10 ROOF PLAN - POWER AND SYSTEMS
D E5.01 ELECTRICAL RISERS
D E5.02 TELECOM RISER AND RACK ELEVATION – ELECTRICAL DEMOLITION
D E5.03 TELECOM RISER AND RACK ELEVATION – ELECTRICAL

E - ROXBORO ELEMENTARY SCHOOL

ARCHITECTURAL
E A1.01 COMPREHENSIVE FIRST FLOOR PLAN
E A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES & DETAILS

ELECTRICAL
E E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
E E0.01 OVERALL ELECTRICAL PLANS

E E0.02 PARTIAL FIRST FLOOR AREA A - ELECTRICAL DEMOLITION
E E0.03 PARTIAL FIRST FLOOR AREA B - ELECTRICAL DEMOLITION
E E0.04 PARTIAL FIRST FLOOR AREA C - ELECTRICAL DEMOLITION
E E0.05 PARTIAL FIRST FLOOR AREA D - ELECTRICAL DEMOLITION
E E0.06 ROOF PLAN - ELECTRICAL DEMOLITION
E E1.01 PARTIAL FIRST FLOOR AREA A - POWER AND SYSTEMS
E E1.02 PARTIAL FIRST FLOOR AREA B - POWER AND SYSTEMS
E E1.03 PARTIAL FIRST FLOOR AREA C - ELPOWER AND SYSTEMS
E E1.04 PARTIAL FIRST FLOOR AREA D - POWER AND SYSTEMS
E E1.05 ROOF PLAN - POWER AND SYSTEMS
E E5.01 ELECTRICAL RISERS
E E5.02 TELECOM RISER AND RACK ELEVATIONS

HVAC
E H0.00 GENERAL NOTES & PARTIAL FIRST FLOOR PLANS – HVAC

F - ALLEN ROAD ELEMENTARY SCHOOL

ENVIRONMENTAL
F X0.01 ASBESTOS REMOVAL PARTIAL FIRST FLOOR PLAN

ARCHITECTURAL
F A1.01 COMPREHENSIVE PARTIAL BASEMENT & FIRST FLOOR PLANS
F A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES & DETAILS
F A5.02 DOOR & FINISH SCHEDULES & DETAILS

ELECTRICAL
F E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
F E0.01 OVERALL ELECTRICAL PLANS
F E0.02 PARTIAL BASEMENT - ELECTRICAL DEMOLITION
F E0.03 PARTIAL FIRST FLOOR AREA A - ELECTRICAL DEMOLITION
F E0.04 PARTIAL FIRST FLOOR AREA B - ELECTRICAL DEMOLITION
F E0.05 PARTIAL FIRST FLOOR AREA C - ELECTRICAL DEMOLITION
F E1.01 PARTIAL BASEMENT PLAN - POWER AND SYSTEMS
F E1.02 PARTIAL FIRST FLOOR AREA A - POWER AND SYSTEMS
F E1.03 PARTIAL FIRST FLOOR AREA B - POWER AND SYSTEMS
F E1.04 PARTIAL FIRST FLOOR AREA C - POWER AND SYSTEMS
F E5.01 EMERGENCY COMMUNICATIONS RISER
F E5.02 TELECOM RISER AND RACK ELEVATIONS

H - BEAR ROAD ELEMENTARY SCHOOL

ARCHITECTURAL
H A1.01 COMPREHENSIVE FIRST FLOOR PLAN

ELECTRICAL
H E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
H E1.01 FIRST FLOOR PLAN - ELECTRICAL
H E5.01 ELECTRICAL RISERS

J - SMITH ROAD ELEMENTARY SCHOOL

ARCHITECTURAL
J A1.01 COMPREHENSIVE FIRST FLOOR PLAN
J A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES & DETAILS

ELECTRICAL
J E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
J E0.01 OVERALL ELECTRICAL PLANS
J E0.02 PARTIAL FIRST FLOOR PLAN AREA A - ELECTRICAL DEMOLITION
J E0.03 PARTIAL FIRST FLOOR PLAN AREA B - ELECTRICAL DEMOLITION
J E0.04 PARTIAL FIRST FLOOR PLAN AREA C - ELECTRICAL DEMOLITION
J E0.05 PARTIAL FIRST FLOOR PLAN AREA D - ELECTRICAL DEMOLITION
J E1.01 PARTIAL FIRST FLOOR PLAN AREA A - POWER AND SYSTEMS
J E1.02 PARTIAL FIRST FLOOR PLAN AREA B - POWER AND SYSTEMS
J E1.03 PARTIAL FIRST FLOOR PLAN AREA C - POWER AND SYSTEMS
J E1.04 PARTIAL FIRST FLOOR PLAN AREA D- POWER AND SYSTEMS
J E5.01 ELECTRICAL RISERS

HVAC
J H0.00 GENERAL NOTES & PARTIAL FIRST FLOOR PLANS – HVAC

K - DISTRICT OFFICE

ARCHITECTURAL
K A1.01 COMPREHENSIVE FIRST FLOOR PLAN
K A5.01 DOOR & WINDOW FRAME TYPES, SCHEDULES & DETAILS

ELECTRICAL
K E0.00 GENERAL NOTES AND LEGENDS - ELECTRICAL
K E0.02 ELECTRICAL PLANS - DEMOLITION
K E1.01 ELECTRICAL PLANS
K E1.02 ENLARGED FAN ROOM PLANS - ELECTRICAL PLANS
K E5.01 EMERGENCY COMMUNICATIONS RISER

END OF INDEX

ADVERTISEMENT
INVITATION FOR BIDS

The North Syracuse Central School District invites sealed bids, in duplicate, for:

Sitework
General Construction
Plumbing
HVAC
Electrical

For: Improvements at the C-NS High School, N. Syracuse Junior High, Gillette Road Middle School, Roxboro Road Middle School, Roxboro Road Elementary, Allen Road Elementary, Bear Road Elementary, Smith Road Elementary, and District Office.

SUBMISSION OF BIDS

Bids will be received by the Owner until 3:00 PM, Local Time, Thursday, September 18th, 2025, by Purchasing Officer Karen Beck, at the District Office, 5355 W. Taft Road, North Syracuse, New York 13212. Contractors should refer to the 2008 Wicks Reform for additional bid submission procedures not otherwise outlined in the contract documents.

OPENING OF BIDS

Bids will be opened and read aloud at 3:05 PM on Thursday, September 18th, 2025, at the District Office, 5355 W. Taft Road, North Syracuse, New York 13212.

EXAMINATION OF CONTRACT DOCUMENTS

Contract Documents may be examined at the following locations:

King + King Architects, LLP
358 West Jefferson Street
Syracuse, NY 13202
315.671.2400
315.671.5500 (f)

Plan & Print Systems, Inc.
6160 Eastern Avenue
Syracuse, NY 13211
315.437.5111
315.463.1510 (f)

Builders Exchange of the Southern Tier
15 Belden Street
Binghamton, NY 13903
607.771.7000
607.771.7001 (f)

Eastern Contractors Association
6 Airline Drive
Albany, NY 12205
518.869.0961
518.869.2378 (f)

Builders Exchange of Rochester
180 Linden Oaks
Suite 100
Rochester, NY 14625
585.586.5460
585.586.1580 (f)

Syracuse Builders Exchange
6563 Ridings Road
Syracuse, NY 13206
315.437.9936
315.437.5044 (f)

Tri-County Builders Exchange Plan Room, c/o
Pickett Building Management
6459 State Highway 23
Oneonta, NY 13820
607.432.6641
607.433.6284 (f)

Mohawk Valley Builders Exchange
10 Main Street, Suite 202
Whitesboro, NY 13492
315.736.2441
315.736.2445 (f)
info@mvbe.com / www.mvbe.com

Northern NY Builders Exchange
22074 Fabco Road
Watertown, NY 13601
315.788.1330
315.788.9357 (f)

Dodge Data & Analytics
www.construction.com

OBTAINING ELECTRONIC CONTRACT DOCUMENTS

Contract Documents may be downloaded from the Plan and Print Systems, Inc. website for a **non-refundable** cost of $49.00. Electronic Contract Documents on a flash drive may also be obtained from Plan & Print (Telephone: 315.437.5111, Fax: 315.463.1510) upon payment of a **non-refundable** $49.00 plus shipping and handling per flash drive. Contact Plan & Print for shipping and handling costs. Checks shall be made payable to **Plan & Print Systems, Inc.**

OBTAINING PAPER CONTRACT DOCUMENTS

Contract Documents may be obtained at Plan & Print Systems, Inc., 6160 Eastern Ave, Syracuse, NY 13211 (Telephone: 315.437.5111, Fax: 315.463.1510) upon receipt of a $100.00 deposit per set. Checks for deposit for Contract Documents shall be made payable to North Syracuse CSD. Cash will not be accepted as a deposit. Prospective Bidders will be issued a maximum of two (2) sets each. Subcontractors, Material Suppliers, etc., will be issued a maximum of one (l) set each.

Contract documents will be delivered via UPS Ground service upon request and receipt of an additional non-refundable delivery and handling charge, payable by separate check to Plan & Print Systems, Inc. Contact Plan & Print for shipping and handling costs.

Any sets required in excess of the above-mentioned maximums are to be obtained directly by interested parties at the full cost of printing, **at their cost**, directly from Plan and Print Systems.

Only complete sets will be issued.

At the time the order is placed, plan holder shall advise Plan and Print Systems of status as to prime bidder, subcontractor, or material supplier and to trade affiliation. Postal address, telephone number, fax number, and email will also be required.

ADDENDA

Addenda for this project will be emailed to each plan holder of record, except as noted. Addenda containing full sized drawings will be issued in hard copy format only and sent via UPS. It is the responsibility of each prospective bidder to submit an accurate email address when requesting Bidding/Contract Documents and to download each addendum. Addenda will be sent to the e-mail address on record.

RETURN OF CONTRACT DOCUMENTS

Upon returning sets promptly and in re-usable condition to **Plan & Print Systems, Inc.** within **30 days** after the date of the Bid opening, deposits will be refunded as follows:

l. Any Bidder will be refunded his or her deposit in full.

2. All other persons receiving any or all the Contract Documents, including Subcontractors and Material Suppliers, will be refunded their deposit in full.

All Contract Documents received (except for Documents held by Successful Bidders) must be returned to **Plan & Print Systems, Inc**., at the above address.

For Contract Documents which are not returned to the printer within this 30-day period, deposits will NOT be refunded.

RIGHT TO WAIVE OR REJECT
The Owner reserves the right to waive any informality in or to reject any or all Bids.

BID SECURITY
Each Bidder must deposit with its Bid, security in an amount and form subject to the conditions provided in the Contract Documents.

WITHDRAWAL OF BIDS
Withdrawal of Bids will be subject to the conditions provided in the Instructions to Bidders.

COMPLETION TIME
The work of this project shall be completed by the dates set forth in Section 013100 entitled "Construction Progress Schedule and Submittals."

PRE-BID MEETING
A Pre-Bid Meeting will be held to answer questions that may arise during the bidding period. The meeting will be held at 3:00 P.M. on Thursday, August 28th, 2025 at the Gillette Road Middle School, 6150 South Bay Road, Cicero, New York 13039.

INSPECTION OF SITE
Bidders will be able to visit the Site at the convenience of the North Syracuse Central School District with a minimum of forty-eight hours prior notification to Bob Bouffiou at Watchdog Building Partners, 315-759-9382.

REQUESTS FOR INFORMATION
Requests for interpretation, information or clarification (RFI) of the Contract Documents must be made in writing to King + King Architects. Responses to RFIs will not be made over the telephone. Responses to RFIs will be advisory only and will not modify the Contract Documents. The Contract Documents stand as published except as modified by written Addenda before bid and Modifications after execution of the Agreement.

RFI's shall be simultaneously e-mailed to:

Amanda Thomas athomas@kingarch.com
Stacy Lupiani slupiani@kingarch.com
Bob Bouffiou bbouffiou@watchdogbp.com

END OF INVITATION FOR BIDS

AIA® Document A701® – 2018

Instructions to Bidders

for the following Project:

THE OWNER:

THE ARCHITECT:

King + King Architects, LLP
358 West Jefferson Street
Syracuse, New York 13202
Telephone Number: 315-671-2400

TABLE OF ARTICLES

1 DEFINITIONS

2 BIDDER'S REPRESENTATIONS

3 BIDDING DOCUMENTS

4 BIDDING PROCEDURES

5 CONSIDERATION OF BIDS

6 POST-BID INFORMATION

7 PERFORMANCE BOND AND PAYMENT BOND

8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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User Notes: (728003956)

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;

(Paragraph deleted)

- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

§ 2.2 Conditions Affecting the Work: All Bidders shall visit the site and take such other steps as may be necessary to ascertain the nature and location of the Work, and the general and local conditions which can affect the Work or the cost thereof. All visits must be made with arrangements as specified in the Advertisement or Invitation to Bid. The site visitation shall be limited to those persons or firms who are "Plan holders of Record" or accompanied by "Planholders of Record." In addition, Bidders shall examine all Contract Documents in relation to the site, the structure and condition of the ground, the obstacles which may be encountered and all other conditions having a bearing upon the performance of the Work, superintendence of the Work, requirements for heat, time of completion and all other relevant matters. Failure to take such steps shall not relieve Bidders from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any understanding or representations concerning conditions made by any of its agents, representatives or employees prior to the execution of the Contract, unless included in the Contract Documents.

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§ 2.3 The Bidder's attention has been directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Paragraph deleted)

§ 3.1.2 Any required deposit shall be refunded to Bidders as specified in the Advertisement or Invitation to Bid. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect in writing of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least ten (10) or more business days prior to the date for receipt of
(Paragraphs deleted)
Bids, or earlier if more time may be required, to permit all necessary investigation and to allow sufficient time for a reply to reach all perspective Bidders before submission of their Bids.

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them. Oral explanations or instructions given before award of the Contract will not be binding upon the Owner, the Architect or their representatives.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Substitutions will be considered upon written request as specified in Section 012500, "Equivalency" and as specified in the General Conditions, Article 3, subparagraph 3.4.2 as amended by the Supplementary General Conditions..

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the

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work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 Intentionally deleted.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1

(Paragraphs deleted)

The Architect will endeavor to mail or electronically notify every plan holder of record of any addenda issued. However, it shall be the Bidder's responsibility to make inquiry as to any addenda issued. All such addenda shall become part of the Contract Documents and shall be bound by such addenda whether or not received by the bidders..

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than three days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted in duplicate on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by

(Paragraphs deleted)

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Bid security in the form of a Certified Check of the Bidder or a Bid Bond duly executed by the Bidder as principal and having a Surety Company thereon qualified to do business in the State of the project, in an amount not less than 5% of the amount of the Base Bid, pledging that the Bidder will enter into a Contract with the Owner on the terms stated in the Contract Documents and will, if required, furnish Bonds as described in Article 7 covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract within l0 days after he has been offered a Contract or fails to furnish such bonds, if required, the amount of the Bid security shall be forfeited to the Owner as liquidated damages, not as penalty. The amount of the Bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Subparagraph 6.2.

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of the three lowest Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) forty-five (45) days after formal Bid opening, so long as Bidder has not been notified of the acceptance of its Bid; or (c) all Bids have been rejected.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Paragraph deleted)
As specified in the Advertisement or Invitation to Bid.

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3
(Paragraphs deleted)

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Bidder shall not modify, withdraw or cancel his Bid or any part thereof for forty-five (45) days after the time designated for the receipt of Bids in the Advertisement or Invitation to Bid and the Bidder so agrees in submitting his Bid.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 Within fourteen days of issuance of the Letter of Intent/Notice to Proceed, prior to the Owner's execution of contract, the Contractor shall submit the following information to the Architect in writing:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.2.1 Within seven (7) days of issuance of the Letter of Intent/Notice to Proceed, submit names of superintendent, project manager, or any other corporate representative that will be directly involved in execution of the project.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

§ 6.3.5 Within seven (7) days of issuance of the letter of Intent/Notice to Proceed the Contractor shall submit required Insurance certificates.

§ 6.3.6 Submission of any proposed equivalents shall follow guidelines as indicated in Specification Section 012500 - "Equivalency".

§ 6.3.7 Cost Breakdown: Within twenty-four (24) hours of receipt of bids, the three (3) low bidders shall provide a cost breakdown of their bid into Costs associated for each building.

§ 6.3.8 Submission of information in relation to subcontractors, materials, costs, etc., shall be as specified in the Supplementary General Conditions of the Contract Documents, unless directed otherwise.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 The Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(Paragraphs deleted)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A311, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A132-2019, Standard Form of Agreement Between Owner and Contractor, as modified.

(Paragraphs deleted)

.2 AIA Document A232-2019, General Conditions of the Contract for Construction, as modified.

(Paragraph deleted)

.3 Drawings – see Drawing Index in the Project Manual.

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.4 Specifications – see Index in the Project Manual.

(Paragraph deleted)

.5 Addenda, if any.

(Table deleted)

.6

(Paragraphs deleted)

Other Exhibits:

Bid Form

(Paragraphs deleted)

NYS Prevailing Wage Schedule

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SITEWORK BID FORM

FOR

PROJECT

North Syracuse Central School District
2023 Safety & Security Improvements

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

SITEWORK

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE # L-1	Contingency Cash Allowance	$350,000.00
ALLOWANCE # L-2	Vegetation Cash Allowance	$300,000.00

ALTERNATES (See Project Manual Section 012300)

The Bidder shall submit the following Alternate Bids in accordance with Contract Documents. Alternate bids, if accepted by the Owner, shall become a part of the Contract and shall comply with all of the applicable Contract Documents.

Note: Where the Alternate work does not add to or subtract from the cost of the Base Bid of this work, write the word "None" in the space for Total Add or Deduct. Where the word ADD and the word DEDUCT appear together below, cross out non-applicable word.

ALTERNATE NO. LC-01 (Gillette Road Middle School Softball Field)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. LC-02 (Gillette Road Middle School Baseball Backstop)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. LC-03 (Gillette Road Middle School Dugouts)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. LC-04 (Gillette Road Middle School Stairs)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

UNIT PRICES (See Project Manual Section 012200)

The Bidder shall set forth the cost of all unit prices listed below. Should the work listed below be increased or decreased from the amounts shown on the Contract Drawings and/or Project Manual, upon written notice from the Architect, the undersigned Bidder agrees that the prices quoted below (including all insurance, applicable taxes, equipment, overhead and profit), shall be the basis of his compensation or deduction, as the case may be, for such increase or decrease in his work. All work added shall be at the quoted unit prices, and all work deleted shall be at the quoted unit prices less ten percent (10%). Changes shall be processed in accordance with Contract Documents

ITEM		UNIT OF QUANTITY	TOTAL
L-1	4" Stormwater Management Trench (SMT)	per linear foot	$_____
L -2	Undercutting	per cubic yard	$_____
L -3	Soil Stabilization Fabric	per square yard	$_____
L -4	Medium Duty Asphalt	per square yard	$_____
L -5	Heavy Duty Concrete Sidewalk	per square foot	$_____
L -6	Rock Excavation	per cubic yard	$_____

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 "Summary of Work".

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification Of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the
DAVIS-BACON ACT
(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

GENERAL CONSTRUCTION BID FORM

FOR

PROJECT

North Syracuse Central School District
2023 Safety & Security Improvements

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

GENERAL CONSTRUCTION WORK

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE # G-1	Contingency Cash Allowance	$375,000.00
ALLOWANCE # G-2	Dumpster Cash Allowance	$75,000.00
ALLOWANCE # G-3	Signage Cash Allowance	$140,000.00

ALTERNATES (See Project Manual Section 012300)

The Bidder shall submit the following Alternate Bids in accordance with Contract Documents. Alternate bids, if accepted by the Owner, shall become a part of the Contract and shall comply with all of the applicable Contract Documents.

Note: Where the Alternate work does not add to or subtract from the cost of the Base Bid of this work, write the word "None" in the space for Total Add or Deduct. Where the word ADD and the word DEDUCT appear together below, cross out non-applicable word.

ALTERNATE NO. GC-01 (CNS High School Stair Curtain Wall)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. GC-02 (Gillette Rd MS Pier Reconstruction)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. GC-03 (Gillette Rd MS Foundation Reconstruction)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. GC-04 (CNS High School Entry Reconstruction)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. GC-05 (Gillette Rd MS Flooring Replacement)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

UNIT PRICES (See Project Manual Section 012200)

The Bidder shall set forth the cost of all unit prices listed below. Should the work listed below be increased or decreased from the amounts shown on the Contract Drawings and/or Project Manual, upon written notice from the Architect, the undersigned Bidder agrees that the prices quoted below (including all insurance, applicable taxes, equipment, overhead and profit), shall be the basis of his compensation or deduction, as the case may be, for such increase or decrease in his work. All work added shall be at the quoted unit prices, and all work deleted shall be at the quoted unit prices less ten percent (10%). Changes shall be processed in accordance with Contract Documents

ITEM	UNIT OF QUANTITY	TOTAL
GC-01 Pipe Insulation Abatement	per linear foot	$_____
GC-02 Floor Tile Abatement	per square foot	$_____
GC-03 Transit Panel Abatement	per square foot	$_____
GC-04 Exterior Caulk Abatement	per square foot	$_____
GC-05 Duct Insulation Abatement,	per square foot	$_____
GC-06 Construction of Minor Containment	per minor tent enclosure	$_____
GC-07 Partial-Depth Concrete Restoration, Vertical	per square foot	$_____
GC-08 Partial-Depth Concrete Restoration, Horizontal	per square foot	$_____
GC-09 Partial-Depth Concrete Restoration Overhead	per square foot	$_____
GC-10 FRP Reinforcement on Top Surface	per linear foot	$_____
GC-11 FRP Reinforcement on Bottom Surface	per linear foot	$_____
GC-12 Concrete Foundation Pier - Jacketing	per concrete pier	$_____
GC-13 Metal Pan Stair Tread Reconstruction	per tread	$_____

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary of Work”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ____Dated_____
____Dated_____
____Dated_____
____Dated_____
____Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification Of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the
DAVIS-BACON ACT
(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

PLUMBING BID FORM

FOR

PROJECT

North Syracuse Central School District
2023 Safety & Security Improvements

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

PLUMBING WORK

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE # P-1	Contingency Cash Allowance	$10,000.00

ALTERNATES - NONE

UNIT PRICES - NONE

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 “Summary of Work”.

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ____Dated_____
____Dated_____
____Dated_____
____Dated_____
____Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification Of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

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During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the
DAVIS-BACON ACT
(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

HVAC BID FORM

FOR

PROJECT

North Syracuse Central School District
2023 Safety & Security Improvements

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

HVAC WORK

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE # H-1	Contingency Cash Allowance	$350,000.00

ALTERNATES - NONE

UNIT PRICES - NONE

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

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PERFORMANCE-PAYMENT BOND

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BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ____Dated_____
____Dated_____
____Dated_____
____Dated_____
____Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

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DATE: _____

Certification Of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the
DAVIS-BACON ACT
(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

ELECTRICAL BID FORM

FOR

PROJECT

North Syracuse Central School District
2023 Safety & Security Improvements

SEE INVITATION TO BID FOR DATE, TIME AND PLACE FOR RECEIPT OF BIDS

The undersigned _____
(Name of Bidder)

_____
(Address)

Contact: _____

Phone: _____

Email: _____

The Bidder hereby certifies that he has visited the site and has examined and fully comprehends the requirements and intent of the Plans and Project Manual of the proposed work, and being familiar with all the conditions surrounding the construction of the project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, plant and equipment, and other facilities necessary or proper for or incidental to the performance of the proposed work and does hereby agree to perform all

ELECTRICAL WORK

of the project in accordance with the Contract Documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

The Bidder agrees to furnish all Materials, Labor, and all other costs for the Total Lump Sum Base Bid of

_____DOLLARS ($_____)

These amounts, and the amounts indicated for Alternates, if any, shall be shown in words and figures. In the event of discrepancy, words will govern.

ALLOWANCES (See Project Manual Section 012100)

The Bidder acknowledges the amount shown above **includes** the following allowances:

ALLOWANCE # E-1 Contingency Cash Allowance $500,000.00

ALTERNATES (See Project Manual Section 012300)

The Bidder shall submit the following Alternate Bids in accordance with Contract Documents. Alternate bids, if accepted by the Owner, shall become a part of the Contract and shall comply with all of the applicable Contract Documents.

Note: Where the Alternate work does not add to or subtract from the cost of the Base Bid of this work, write the word "None" in the space for Total Add or Deduct. Where the word ADD and the word DEDUCT appear together below, cross out non-applicable word.

ALTERNATE NO. EC-01 (Gillette Rd MS Lighting Replacement)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. EC-02 (Gillette Rd MS Exterior Lighting)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

ALTERNATE NO. EC-03 (Gillette Rd MS Athletic Lighting)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD/DEDUCT_____DOLLARS ($_____)

ALTERNATE NO. EC-04 (Gillette Rd MS Dugout Power)
The Bidder shall state the amount to be added to or deducted from the Base Bid if this Alternate is accepted.
Total ADD_____DOLLARS ($_____)

UNIT PRICES - NONE

RIGHT TO WAIVE OR REJECT

The Bidder understands that the right is reserved by the Owner to accept or reject any or all bids.

QUALIFICATION OF BIDDER

Upon request after the bid opening, the Bidder shall submit a fully executed AIA A305 Contractor's Qualification Statement, to be qualified as the lowest responsible bidder.

All contractors and subcontractors submitting bids or performing construction work on public work projects or private projects covered by Article 8 of the Labor Law are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. The

Bidder encloses with this Bid a copy of its valid NYSDOL Certificate of Registration. Application for registration is not accepted as a proof of registration and a Bid not accompanied by a valid NYSDOL Certificate of Registration is subject to rejection.

WITHDRAWAL OF BIDS

The Bidder agrees that this bid may not be withdrawn for a period of forty-five (45) calendar days after closing time of same.

PERFORMANCE-PAYMENT BOND

The Bidder agrees, if awarded the Contract, to execute and deliver performance and matching payment bonds in the form bound in the Specifications, both in the amount of the Contract; and to deliver insurance certificates and endorsements for insurance required by the Specifications, upon execution of the Contract. Award of the Contract shall be contingent upon review and acceptance of bonds and insurance by the Owner.

TIME

The Bidder agrees to commence work when directed by the Owner in a Notice-To-Proceed, and to complete the work as specified in Section 011100 "Summary of Work".

BID SECURITY

The Bidder encloses with this Bid this Bid Security required by the Contract Documents in the form of a Certified Check ( ), or Bid Bond ( ) (check one) in the amount of _____ _____DOLLARS ($_____) which represents not less than 5% of the Base Bid.

ADDENDUM RECEIPT

The Bidder Acknowledges Addendum No. ___Dated_____
___Dated_____
___Dated_____
___Dated_____
___Dated_____

SIGNED:_____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

NON-COLLUSIVE BIDDING CERTIFICATION:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

SIGNED: _____

TITLE: _____

FOR: _____
(Firm - Indicate if Corporation, Partnership, Individual, Other)

FIRM ADDRESS: _____

STATE INCORPORATED, IF INCORPORATED: _____

CORPORATE SEAL, IF INCORPORATED, SHALL BE STAMPED BELOW

DATE: _____

Certification Of Compliance with the
NEW YORK STATE IRAN DIVESTMENT ACT OF 2012
(Must be signed and returned with Bid)

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, Bidder/Contractor (or any assignee) certifies that it is not on the "Entities Determined To Be Non-Responsive Bidders/Offerers Pursuant to The New York State Iran Divestment Act of 2012" list ("Prohibited Entities List") posted on the OGS website at: http://www.ogs.ny.gov/about/regs/docs/ListofEntities.pdf and further certifies that it will not utilize on such Contract any subcontractor that is identified on the Prohibited Entities List. Additionally, Bidder/Contractor is advised that should it seek to renew or extend a Contract awarded in response to the solicitation, it must provide the same certification at the time the Contract is renewed or extended.

During the term of the Contract, should the Owner receive information that a person (as defined in State Finance Law §165-a) is in violation of the above-referenced certifications, The Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

The Owner reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

Any bid hereafter made to any political subdivision of the state or any public department, agency or official thereof by a corporate bidder for work or services performed or to be performed or goods sold or to be sold, where competitive bidding is required by statute, rule, regulation, or local law, deemed to have been authorized by the board of directors of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of this certificate as to compliance with the New York State Iran Divestment Act of 2012.

NAME (PRINT OR TYPE) _____

SIGNATURE _____

TITLE _____

Certification Of Compliance with the
DAVIS-BACON ACT
(Must be signed and returned with Bid)

_____, a representative of _____, hereby swears to and certifies that, to the best of his or her knowledge and belief:

1. Neither _____, nor any substantially owned-affiliated entity of the Bidder (collectively the "Bidder"), has been found to be in violation of the Davis-Bacon Act pursuant to 40 U.S.C. 3144, the Copeland Act pursuant to 18 U.S.C. 874 and 40 U.S.C. 3145 or the Contract Work Hours and Safety Standards Act pursuant to 40 U.S.C. 332, or their New York State counterparts.

2. If the Bidder has been found to be in violation of the Davis-Bacon Act, the Copeland Act, the Contract Work Hours and Safety Standards Act, or any of their New York State counterparts, state the name of the agency, the date of the violation, the nature of the violation and any consequence of the violation, including warnings, fines and debarments below.

3. The Bidder is not currently under investigation by any local, state or federal government agency. If Bidder is under investigation, state the name of the agency, the date of the alleged violation and the nature of the alleged violation below.

4. The Bidder's Dun & Bradstreet D-U-N-S number is _____.

5. I have authority to execute this certification, knowing it will be relied upon by the Owner of this Project.

SIGNED: _____

TITLE: _____

FOR: _____
(Name of Bidder)

STATE OF NEW YORK)
COUNTY OF)

On _____, before me, the undersigned, a Notary Public in and for said to me State, personally appeared _____ personally known to me or proved on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity(ies), and that by his/her signature(s) on the instrument, the individual(s) or the person on behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

END OF BID FORM

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

for the following PROJECT:
(Name, and location or address)

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

THE OWNER:
(Name, legal status, and address)

THE ARCHITECT:
(Name, legal status, and address)

King + King Architects, LLP
358 West Jefferson Street
Syracuse, New York 13202

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT AND CONSTRUCTION MANAGER

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

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§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building

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Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements,

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User Notes: (1750087014)

assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction

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where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or

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(2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

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§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract

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Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

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§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be

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through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

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§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

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§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

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§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section

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15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all

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Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality

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or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor

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fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction

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Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data

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establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and

.4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

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§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of

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tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the

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Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to

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requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become

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requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

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.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

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§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation

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within 30 days of receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

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§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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SUPPLEMENTARY GENERAL CONDITIONS TO AIA DOCUMENT A232-2019 GENERAL CONDITIONS FOR THE CONTRACT OF CONSTRUCTION, DATED _____, BY AND BETWEEN _____ ("OWNER") AND _____ ("CONTRACTOR").

GENERAL CONDITIONS

The General Conditions of the Contract for Construction, AIA Document A232-2019, Articles 1 through 15, is hereby designated as one of the Contract Documents, and shall govern the Work under this Contract.

SUPPLEMENTARY GENERAL CONDITIONS

These Supplementary General Conditions are likewise designated one of the Contract Documents, and amend and supplement, and in some cases, void portions of the General Conditions as set forth here and except as hereby amended and supplemented (or voided), the AIA General Conditions shall remain in full force and effect. The article numbers set forth in the Supplementary General Conditions correspond to (or are in addition to) the article numbers set forth in the AIA General Conditions (AIA Document A232-2019).

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

Modify subsection 1.1.1 as follows:

1.1.1 THE CONTRACT DOCUMENTS

In the second line, before “Conditions of the Contract”, insert “Instructions and Supplementary Instructions to Bidders, and submitted bid forms.”

Delete the last sentence of this Subsection 1.1.1 and replace it with the following:

The Contract Documents shall include, without limitation, the contents of the Project Manual and the Drawings.

1.1.17 GENERAL PROVISIONS

Add the following subsection 1.1.17 in its entirety and replace it with the following:

1.1.17 THE PROJECT MANUAL

The "Project Manual" is the volume(s) assembled for the Work which includes, but is not limited to, the bidding requirements, sample forms, all the Conditions of the Contract, and the Specifications.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following new subsections 1.2.4, 1.2.5, and 1.2.6 after subsection 1.2.3:

1.2.4 By executing the Contract, Contractor represents and warrants to Owner, Architect and Construction Manager that (i) Contractor is and will be financially responsible and has and will have sufficient liquidity to meet its financial responsibilities under the Contract and for all other Projects in which Contractor is or may become involved; (ii) Contractor has carefully examined the Drawings, Specifications and Associated Documents and has visited and examined the site, or deems such visit and examination to be unnecessary; (iii) from Contractor's investigation, Contractor has satisfied itself as to the nature and location of the proposed work, the general and local conditions, and all matters which may in any way affect the work or its performance; and (iv) Contractor fully understands the intent and purpose of the Contract Documents. Claims for additional compensation and/or extension of time relating to Contractor's noncompliance with its representation and warranties in the preceding sentence will not be allowed.

1.2.5 If, in the interpretation of the Contract Documents, requirements within the Drawings and Specifications conflict, or it appears that the Drawings and Specifications are not in agreement or there is a conflict between contract documents and applicable standard codes or ordinances, the requirement to be followed shall be decided by the Architect. Where there is a discrepancy in quantity, the Contractor shall provide the greater quantity; where there is a discrepancy in quality, the Contractor shall provide the superior quality; where there is a conflict in the code, ordinance or other standard, the Contractor shall comply with more stringent code, ordinance or other standard at Architect’s reasonable discretion. Addenda supersede the provisions that they amend.

1.2.6 Written interpretations necessary for the proper execution or progress of the Work, in the form of drawings or otherwise, will be issued with reasonable promptness by the Architect. Either party to the Contract may make written request through the Construction Manager to the Architect for such interpretations. Such interpretations shall be consistent with and reasonably inferable from the Contract Documents, and may be effected by Field Directive. Architect’s interpretation of contract documents shall be final.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER INSTRUMENTS OF SERVICE

Delete subsections 1.5.1 and 1.5.2 in their entirety and replace with the following:

1.5.1 Contractor shall receive as part of its Contract without cost ten (10) copies of Drawings and Specifications.

1.5.2 Any Drawings and Specifications in excess of those provided in subsection 1.5.1 shall be furnished to Contractor at cost of reproduction, postage, and handling.

Add subsection 1.5.3

1.5.3 Subcontractors and others desiring copies of Drawings and Specifications shall obtain them from Contractor.

1.6 WRITTEN NOTICE

Insert new subsection 1.6.3 as follows:

1.6.3 Add the following sentence at the end of this subsection:

ALL NOTICE REQUIREMENTS SHALL BE STRICTLY CONSTRUED.

ARTICLE 2 - OWNER

2.1 GENERAL

Delete the second sentence of subsection 2.1.1 in its entirety and replace it with the following:

The Owner is a Central School District, organized and operating pursuant to the laws of the State of New York. All final decisions are made by the Board of Education, although the Board may delegate limited authority as it may require.

Add the following subsection 2.1.3:

2.1.3 Wherever the word Owner or a pronoun in place of it occurs in the Contract Documents it refers to the

North Syracuse Central School District
5355 West Taft Road
North Syracuse, New York 13212

Attention:

2.2 EVIDENCE OF THE OWNER'S FINANCIAL ARRANGEMENTS

Delete 2.2.1 in its entirety and replace with "Owner shall provide a copy of the referendum, at Contractor's request."

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Add the following subsections 2.3.2.1 and 2.3.2.2:

2.3.2.1 Wherever the word Architect or Architects or a pronoun in place of them occurs in the Contract Documents it refers to:

King + King Architects
358 West Jefferson Street
Syracuse, NY 13202

Attention:

2.3.2.2 The firms, if any, listed on the title sheet of the Project Manual are Consultants employed by the Architect and are agents of the Architect and will make observations of their respective branches of the Work. All changes in the Work must be processed by the Architect, through the Construction Manager.

Add the following subsection 2.3.3.1:

2.3.3.1 Wherever the phrase Construction Manager or a pronoun in place of it occurs in the Contract Documents it refers to the Construction Manager:

Watchdog Building Partners
3445 Winton Place, Suite 102
Rochester, NY 14623

Attention: Todd LaBarr, President

Modify subsection 2.3.5 as follows:

2.3.5 Add the words "endeavor to" after the word "shall" in line one.

Modify subsection 2.3.6 as follows:

2.3.6 Add the words "endeavor to" after the word "shall" in line one.

2.4 OWNER'S RIGHT TO STOP THE WORK

Modify subsection 2.4 as follows:

2.4 Following the end of the subsection add, “This right is in addition to, and not in derogation of, the Owner’s rights under Section 12.2.”

2.5 OWNER'S RIGHT TO CARRY OUT THE WORK

Delete subsection 2.5 in its entirety and replace it with the following:

2.5.1 If the Contractor defaults, fails or neglects to carry out the Work in accordance with the Contract Documents and fails within a five calendar day period after receipt of written notice from Owner to commence and continue correction of such default, failure or neglect with diligence and promptness, Owner may, without further notice (except to inform the Contractor its attempt to cure is inadequate) and without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from Payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Construction Manager's and Architect's additional services and expenses made necessary by such default, failure or neglect. If Payments then or thereafter due are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.5.2 In the event the Contractor fails, refuses or neglects to perform closeout obligations, including without limitation performance of punchlist items, within sixty (60) days following the contract scheduled date of Substantial Completion, Contractor shall be liable to the Owner for any additional costs, including without limitation those charged by Architect, Attorneys, Construction Manager or others attributable to such failure, refusal or neglect.

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Add the following to the end of subsection 3.2.1:

The Contractor shall be liable to the Owner for any damage resulting from any substantive or obvious errors, inconsistencies or omissions in the Contract Documents not reported to the Construction Manager in writing prior to performance of any affected Work.

3.4 LABOR AND MATERIALS

Add the following subsections and clauses 3.4.4, 3.4.5, 3.4.6, and 3.4.7:

3.4.4 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in General Requirements (Division 1 of the Specifications) and as set forth below.

3.4.5 The Architect will be allowed a reasonable time within which to evaluate each proposed substitution. The Architect will be the sole judge of equivalence, and no substitution shall be ordered, installed or utilized without the Architect's prior written acceptance. Owner may require Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any substitution. The Architect will record time required by the Architect and the Architect's Consultants in evaluating substitutions proposed by Contractor and in making changes in the Contract Documents occasioned thereby. Whether or not the Architect accepts a proposed substitution, Contractor shall reimburse Owner for the charges of the Architect and the Architect's consultants for evaluating each proposed substitution.

3.4.6 By making requests for substitutions based on subsection 3.4.4 above, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contract Documents require for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent;

.4 will coordinate the installation of the accepted substitution making such changes as may be required for the Work to be complete in all respects;

.5 represents that he will reimburse the Owner for additional costs from claims by other Contractors resulting from incorporation of requested substitution; and

.6 represents that he will reimburse the Owner for all additional costs billed by the Architect or his consultants for the review of the substitution request(s), any redesign of the Work of this Contractor or associated Contractors, additional site visits related to the substitution request and for the work to prepare Change Directives or Change Orders.

3.4.7 Substitution of materials and Equipment. Whenever a material, article, device, piece of equipment or type of construction is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, catalog numbers, or similar specific information, it is so identified for the purpose of establishing a standard of quality, and such identification shall not be construed as limiting competition. Any material, article, device, piece of equipment or type

of construction of other manufacturers and vendors that will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, device, piece of equipment or type of construction so proposed is completely described in submittals to the Architect and is, in the opinion of the Architect, of equal substance, appearance, and function. No substitute material shall be purchased or installed by the Contractor without the Architect's written approval. Material that, in the Architect's opinion is inferior to that specified or is unsuited for the intended use will be rejected. The Architect's decision regarding acceptance of equals shall be final.

3.6 TAXES

Add the following subsections 3.6.1, 3.6.2 and 3.6.3:

3.6.1 Owner represents that it is an organization operated for purposes which makes it exempt from New York Sales and Compensating Use Tax pursuant to Section 1115(a)(15) of the tax law, as amended by laws of New York 1974, Ch. 513 and 514. The Contractor is advised that the Owner is exempt from payment of all State and Local sales and compensating use taxes of the State of New York and cities and counties on the purchase of all materials and supplies incorporated in and becoming an integral component part of the structures, buildings or real property, pursuant to the provisions of this Contract. Such taxes are not to be included in the Contract price, bid or costs to be reimbursed, as the case may be. This exemption does not, however, apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor or to supplies and materials which, even though they are consumed in the performance of the Contract, are not incorporated into the completed permanent work, and the Contractor and his subcontractors shall be responsible for and pay all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property upon all such unincorporated supplies and materials. Owner shall deliver to Contractor the appropriate exemption certificate required to be supplied by the Owner and Contractor and his subcontractors and materialmen shall be solely responsible for obtaining or delivering any and all exemption or other certificates and for furnishing a Contractor Exempt Purchase Certificate or other appropriate certificates to all persons, firms or corporation from whom they purchase supplies, materials and equipment for the performance of the work covered by this Contract.

3.6.2 Except as otherwise specified, all Federal, State and Local taxes are included in the Contract price.

3.6.3 Each Contractor shall pay and include in his bid all costs and liabilities for the amounts assessed, or which may be assessed by the Federal, State and local governments under any and all Acts or Laws upon the wages and salaries paid or to be paid all employees of the Contractor and his subcontractors under this

Contract and shall provide to the Owner on a regular basis, certified payrolls in accordance with law.

3.7 PERMITS, FEES NOTICES, AND COMPLIANCE WITH LAWS

Add to the end of 3.7.3 the following clause:

to remedy such defective or inconsistent work including without limitation additional costs to the Owner for design, construction management or legal services.

3.8 ALLOWANCES

Delete subsection 3.8.1 in its entirety and replace it with the following:

3.8.1 Material Allowance

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. These allowances shall cover the net cost of the materials and equipment delivered and unloaded at the site, and all applicable taxes. The Contractor's handling costs on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance. The Contractor shall cause the Work covered by these allowances to be performed for such amounts and by such persons as the Construction Manager may direct, but he will not be required to employ persons against whom he makes a reasonable objection. If the cost, when determined, is more than or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order which will include additional and actual handling costs on the site, labor, installations costs, overhead, profit and other expenses resulting to the Contractor and demonstrated to the Construction Manager from any increase over the original allowance.

Delete subsection 3.8.2 in its entirety and replace it with the following:

3.8.2 Field Directed Work Allowance

Contractor shall include allowances as defined in Specification Section 01020 in its base bid proposal. Overhead and profit for these allowances shall be included in the base bid and are not part of the allowances. Allowances shall be adjusted as required for field directed additional work. In the event the total of field directed work under the Contract does not exceed the total amount of the allowance, the difference shall be credited to the Owner by Change Order. Allowances shall be used only upon written authorization of the Construction Manager.

Add the following subsection 3.8.4, following 3.8.3:

§3.8.4 Escalation Allowance

The Owner has determined at the time of bidding that the following materials may be affected by raw materials shortages, supply chain interruptions, or certain other limited and unforeseen conditions.
- N/A

The Contractor's bid price shall contain a materials escalation allowance of N/A which shall be available to the Contractor under strict conditions precedent, each and every one of which must be met to draw from the allowance, for unforeseen changes in the price or availability of the materials listed above. This allowance shall cover the net increased cost of the materials and equipment delivered and unloaded at the site, and all applicable taxes. The Contractor's handling costs on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original bid shall be included in the Contract Sum and not in the allowance, except to the extent increased by the cost escalation. Any sum paid under the allowance shall include increased cost of materials caused by unforeseen conditions, such as raw material shortages and supply chain failures, which increases the price of materials in excess of fifteen percent (15%). No amount will be paid for increased general conditions or office overhead. In the event the entire allowance is not used, the remainder shall be returned to the Owner.
Any sum approved by Owner pursuant to this allowance shall include all material acquisition costs including storage.

The following events must occur to receive compensation under this allowance:

(1) Each Contractor shall submit required shop drawings within thirty days of contract award AND order all materials for the work of the project within seven (7) days after return of approved shop drawings. Failure to place the material order within the allotted time ends Contractor's rights under this section.

(2) In the event of an unforeseen price increase, Contractor shall promptly notify Construction Manager in writing and propose a change order covering the difference in cost, which includes supporting documents evidencing the reason for the price increase, the price of the materials and the expected delivery date.

(3) The Owner shall not pay for increased hours for installation of the same material unless a delay affects the project schedule. If schedule is impacted, Owner shall pay reasonable and necessary difference in overtime and second shift costs, and will pay the current prevailing wage rates.

(4) Only the additional cost of materials and approved overtime will be compensated, without markup for overhead, profit or general conditions. The Owner shall not pay for extended overhead and/or general conditions.

3.9 SUPERINTENDENT

Add the following to the end of subsection 3.9.1:

Important Communications, including all those that may affect cost, schedule, quality or safety, must be confirmed in writing by the Contractor to the Construction Manager, prior to commencement or continuation of any affected Work.

3.10 CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES

Add the following subsection 3.10.5:

3.10.5 The progress schedule and proposed changes shall be in the form of a bar chart or as otherwise directed by the Construction Manager suitable in size and scale to show clearly the various divisions of the Work and indicating approximately the percentage of the Work scheduled to be in progress at any one time.

3.14 CUTTING AND PATCHING

Add the following subsection 3.14.3:

3.14.3 Refer to the Specifications for additional cutting and patching requirements.

3.15 CLEANING UP

Add the following subsection 3.15.3:

3.15.3 Refer to the Specifications for additional cleaning up requirements.

3.18 INDEMNIFICATION

Delete subsection 3.18.1 and replace it with the following subsection 3.18.1 and clause 3.18.1.1:

3.18.1 To the maximum extent permitted by law, Contractor hereby assumes the entire responsibility and liability for any and all damage (direct or consequential) and injury (including death), disease or sickness of any kind or nature whatsoever, not caused solely and entirely by the Owner, to all persons, whether or not employees of Contractor, and to all property and business or businesses, caused by, resulting from, arising out of, or occurring in connection with (i) the Work; (ii) the performance or intended performance of the Work; (iii) the performance or failure to perform the Contract; or (iv) any occurrence which happens in or about the area where the Work is being performed by the Contractor, either directly or through a subcontractor, or while any of Contractor's property, equipment or personnel is in or about such area.

3.18.1.1 Except to the extent, if any, expressly prohibited by law, should any such damage or injury referred to in subsection 3.18.1 be sustained, suffered, or incurred by

Owner, Architect or Construction Manager, or should any claim for such damage or injury be made or asserted against any of them, whether or not such claim is based upon Owner's, Architect's or Construction Manager's alleged active or passive negligence or participation in the wrong or upon any alleged breach of any statutory duty or obligation on the part of the Owner, Architect or Construction Manager, Contractor shall indemnify and hold harmless Owner, Architect and Construction Manager, their officers, agents, partners, and employees (hereinafter collectively referred to as "Indemnitees"), of, from and against any and all other loss, cost, expense, and liability, including without limitation, legal fees and disbursements, that Indemnitees may directly or indirectly sustain, suffer or incur as a result of such damages, injuries and claims; and Contractor agrees to assume, on behalf of any and all Indemnitees the defense (with counsel satisfactory to the party indemnified) of any action at law or in equity, or other legal proceeding, which may be brought against any Indemnitee upon or by reason of such damage, injury or claim and to pay on behalf of every Indemnitee, the amount of any judgment, decree, award, or order that may be entered against each said Indemnitee in any such action or proceeding. In the event that any such claim, loss, cost, expense, liability, damage or injury is sustained, suffered, or incurred by, or is made, asserted or threatened against any Indemnitee, Owner shall, in addition to all other rights and remedies, have the right to withhold from any payments due and to become due to Contractor an amount sufficient in Owner's judgment to protect and indemnify the Indemnitee(s) from and against any and all such claim, loss, cost, expense, liability, damage or injury, including legal fees and disbursements; or Owner, in its discretion, may require Contractor to furnish a surety bond satisfactory to Owner guaranteeing such protection, which bond shall be furnished by Contractor within five (5) days after written demand has been made therefore. In the event more than one Contractor is connected with an event or occurrence (or series of events or occurrences) covered by this indemnification, then all such Contractors shall be jointly and separately responsible to the Indemnitees, and the ultimate responsibility among such indemnifying Contractors shall be settled or otherwise determined by separate proceedings and without loss, expense or damage to any Indemnitee.

Add the following subsections 3.18.3, 3.18.4, 3.18.5, 3.18.6, and 3.18.7:

3.18.3 No provision of this Section 3.18 shall be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described therein.

3.18.4 In any and all claims against the Owner, the Architect or the Construction Manager or their agents or employees by third parties, the indemnification obligation under this Section 3.18 shall apply and shall not be limited by limitation or amount of or type of damages, compensation, or benefits payable by or for the Contractor or Subcontractors.

3.18.5 Contractor shall comply with, and cooperate with other contractors, Construction Manager, Architect, and/or Owner in complying with Legal Requirements, including but not limited to OSHA requirements. Among other things, Contractor shall be responsible for performing corrective work within abatement periods, appealing from decisions or orders, requesting extensions on abatement periods, and furnishing such information or evidentiary material as may be necessary or as may be requested by Construction Manager and/or Owner to fully protect the rights and interests of Owner, Architect, and Construction Manager with respect to possible, threatened or pending proceedings or orders.

3.18.6 Without limitation, Contractor shall indemnify Owner and/or Architect and/or Construction Manager pursuant to section 3.18 hereof in respect of Section 3.18.6 and the responsibilities of Contractor specified in Article 13 and Sections 3.6.2, 3.19.10, 3.19.13, and 3.19.14, pertaining to Legal Requirements.

3.18.7 Prevention of accidents at the site is the responsibility of the Contractor, its employees, subcontractors and suppliers, and all other Contractors, persons and entities at the site. The Contractor shall establish its own safety program, implementing safety measures, policies, and standards conforming to those required by governmental and quasi-governmental authorities having jurisdiction. The Construction Manager is not responsible for identifying unsafe practices, and the Construction Manager's failure to stop the Contractor's unsafe practices shall not relieve the Contractor of the responsibility thereof. The Contractor shall indemnify the Owner, Architect and Construction Manager for fines and penalties imposed on the Owner, Architect or Construction Manager as a result of safety violations.

Add the following section 3.19 and subsections 3.19.1, 3.19.2, 3.19.3, 3.19.4, 3.19.5, 3.19.6, 3.19.7, 3.19.8, 3.19.9, 3.19.10, 3.19.11, 3.19.12, 3.19.13, 3.19.14, 3.19.15, 3.19.16, 3.19.17, 3.19.18, 3.19.19, 3.19.20 and 3.19.21.

3.19 CONTRACTOR'S ADDITIONAL RESPONSIBILITIES

3.19.1 Contractor agrees that, in addition to all other responsibilities and duties under the Contract, the Contractor shall:

.1 furnish a competent and adequate staff and use its best skill and attention for the proper administration, coordination, supervision and superintendence of the Work;

.2 organize the procurement of all materials and equipment so that they will be available at the time they are needed for the Work;

.3 keep an adequate force of skilled workers on the job to complete the Work in strict accordance with all requirements of the Contract Documents;

.4 maintain throughout the duration of the Work a competent superintendent and any necessary assistants, all of whom shall be acceptable to Owner and shall not be changed without the consent of the Owner;

.5 enforce discipline and order among Contractor's employees and not to employ at the Project any unfit person or anyone not skilled in the task assigned; and

.6 provide supervision by experts in all aspects of the application of the materials, equipment or system being fabricated and installed.

3.19.2 The Contractor, its employees, agents, representatives, sub-contractors and subcontractor's employees, agents and representatives shall not use tobacco or marijuana in any form on school property during the course of the Work. Contractors failing to abide by and enforce this requirement shall be prohibited from working at the site and shall be responsible for any consequent delays or added costs to the Owner as a result of such noncompliance.

3.19.3 The Contractor shall require each employee, subcontractor or other person for whom it is responsible at the Project site to wear reasonable and visible photo identification, and shall, upon request of the Owner, make available a list of names of those employees, subcontractors or others working under the direction of the Contractor at the Project site. Such identification shall be in a form prepared by the Owner in conjunction with the Construction Manager and shall include such information as the Owner deems reasonable and necessary. Any such identification shall be reasonably visible to the Architect, Construction Manager and to school personnel at all times to allow the Owner to maintain the safety and security of school buildings, school property and persons at the Project site. Contractors failing to abide by this requirement shall be prohibited from working at the site and shall be responsible for any consequent delays or added costs to the Owner as a result of such noncompliance.

3.19.4 Directions given to Contractor's Superintendent shall be binding upon Contractor, and the Superintendent's signature shall bind the Contractor.

3.19.5 The Contractor shall submit to Owner, Construction Manager and Architect promptly upon request, information with respect to the names, responsibilities and titles of the principal members of Contractor's staff.

3.19.6 The Contractor shall carefully study and compare, one with the other, all Drawings, Specifications and other instructions and at once report in writing to Construction Manager and Architect any error or omission (including variance from any Legal Requirements); and is to subsequently proceed with the Work in accordance with instructions from Construction Manager concerning such error, omission or variance.

3.19.7 The Contractor shall use all necessary means to discover and to notify Architect in writing of any defect in other Work upon which the satisfactory performance of the Work may depend, and to allow a reasonable amount of time for remedying such defects. If Contractor should proceed with the Work, Contractor shall be considered to have accepted and be responsible for such other Work unless over Contractor's written objection, Contractor shall have proceeded pursuant to written instructions from Architect.

3.19.8 The Contractor shall furnish sufficient temporary facilities and shanties, material storage rooms, field offices, etc., which shall be placed in locations designated by Construction Manager. When it becomes necessary, due to the progress of the Project, for Contractor to relocate such facilities, shanties, rooms, and/or offices, Contractor will do so in an expeditious manner and at no additional cost. Shanties, storage rooms, field offices, etc., shall be equipped with fire extinguishers and shall be of fireproof material only, such as concrete, concrete masonry unit, rated drywall, or sheet metal.

3.19.9 The Contractor shall pay charges for the costs of repair to other Work attributable, in whole or in part, to the fault or negligence of Contractor, and Owner's charges for removal of rubbish attributed by Owner, Construction Manager or Architect to Contractor, and any cleanup related to Contractor or the Work.

3.19.10 The Contractor shall pay all royalties and license fees applicable to the Work. Contractor shall defend, indemnify and hold Owner, Architect/Engineer and Construction Manager harmless of, from and against any and all suits, demands and claims for infringement of any patent rights except to the extent that a particular design, process or product is specified in the Contract Documents. The foregoing exception shall be inapplicable if Contractor had or should have had reason to believe the design, process, or product infringed upon a patent, and failed to give written notification to Construction Manager of same.

3.19.11 Contractor agrees that, in the event of any dispute as to whether any item or portion of the Project is within the scope of the Work to be performed by Contractor or any dispute as to whether Contractor is entitled to an extra payment, Contractor shall continue to proceed diligently with the performance of the Work, the Contract, and the disputed Work. The resolution, by agreement or otherwise, of the disputed Work, shall be made between Contractor and Owner with reasonable promptness. In no event shall delay in such resolution excuse prompt performance by Contractor of the Work, the Contract and the disputed Work.

3.19.12 The Contractor shall not display on or about the Project site any sign, trademark or other advertisement, except to identify trailers, vehicles or equipment.

3.19.13 The Contractor shall comply with all legal requirements; appear at hearings, proceedings or in court in respect of such compliance or in respect of violations

or claimed violations of legal requirements; pay any fines or penalties imposed for said violations; and pay all legal fees, fines and penalties incurred by or imposed upon Owner relating to Contractor's compliance, violations or claimed violations. Without limiting the foregoing, Contractor shall appear at hearings, proceedings and/or in court and consent to its substitution as a party defendant in respect of all summonses and claimed violations arising out of or relating to the Work.

3.19.14 The Contractor agrees that, if any Work is performed which is contrary to legal requirements, the Contractor shall promptly make all changes as required and take all other corrective action to comply therewith and pay all costs arising therefrom.

3.19.15 The Contractor shall take all steps necessary to avoid labor disputes; and to be responsible for any delays and damages to Owner caused by such disputes.

3.19.16 The Contractor shall employ individuals that are compatible with the employees of other Contractors; take all steps necessary that are consistent with the Law to minimize the potential for labor disputes; and be responsible for any delays and damages to Owner caused by such disputes.

3.19.17 The Contractor agrees that, if any provision of the Contract Documents conflicts with any agreement among members of trade associations, or with a union or labor council which regulates the work to be performed by a particular trade, the Contractor shall reconcile such conflict without delay or damage to Owner.

3.19.18 Before any subcontractor or supplier is employed by Contractor, the name of such Subcontractor or supplier shall be submitted in writing to the Architect and Owner through the Construction Manager, and no Subcontractor or supplier shall be employed unless acceptable to the Owner. Each Subcontractor and supplier shall be bound by all Contract Documents to the same extent and with the same effect as if the Subcontractor or supplier were the Contractor. Contractor shall cause Subcontractors and suppliers to comply with all the Contract Documents. Contractor shall be responsible for all the acts, work, material and equipment of its Subcontractors and supplier and all persons either directly or indirectly employed by any of them.

3.19.19 Any review or consideration by Owner or Architect of any method of construction, invention, appliance, process, article, device or material of any kind shall be for its general adequacy for the Work and shall not be an approval for the use thereof by Contractor in violation of any patent or other rights of any third person. Owner and Architect shall in no event be deemed to have reviewed or to have been required to review or consider the means and methods of construction, all of which are chosen exclusively by the Contractor.

3.19.20 The Contractor shall afford Other Contractors reasonable opportunity for introduction and storage of their materials and for the execution of Other Work.

3.19.21 The Contractor, its employees and Subcontractors and their employees shall be subject to and abide by rules and regulations established by the Owner. No weapons of any kind shall be permitted on site, there shall be no harassment of a sexual, ethnic or religious nature; there shall be no contact with students except in emergencies; there shall be no use of profanity.

ARTICLE 4 – ARCHITECT AND CONSTRUCTION MANAGER

4.2 ADMINISTRATION OF THE CONTRACT

Add the following clause 4.2.1.1:

4.2.1.1 The Contractor, Architect and Construction Manager, notwithstanding any provision to the contrary, have an affirmative duty to promptly notify the Owner of what may appear to them to be a violation of law relevant to the Work of this Contract which he or she may at any time observe.

Delete subsection 4.2.18 in its entirety and replace with the following:

4.2.18 Consistent with section 15.2, the Architect shall be, in the first instance, the interpreter of the requirements of the Contract Documents. The Construction Manager shall be the judge of the performance of the Contractor. The Architect shall promptly render and deliver to the Construction Manager Architect's written interpretations in an expeditious and timely manner so as not to interrupt or delay the execution or progress of the Work. The Construction Manager shall promptly report substantial exceptions to Contractor's performance in writing to Owner and Architect.

ARTICLE 5 - SUBCONTRACTORS

5.1 DEFINITIONS

Modify subsection 5.1.1 as follows:

5.1.1 In line two, delete the words “at the site.”

Modify subsection 5.1.2 as follows:

5.1.2 In line two, delete the words “at the site.”

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Add the following subsection 5.2.5:

5.2.5 The successful bidders for each Contract shall submit to the Construction Manager and to the Architect within five (5) calendar days after receipt of notification of award of contract, a list of subcontractors, Material Suppliers and Manufacturers used in preparation of the bid and are proposed for such portions of the Work as designated on the form supplied.

Add the following subsection 5.2.6:

5.2.6 The Contractor shall not award work to any one subcontractor in excess of fifty (50) percent of the Contract Sum, without prior written approval of the Owner.

5.3 SUBCONTRACTUAL RELATIONS

Delete subsection 5.3 in its entirety and replace it with the following:

5.3 By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner, Architect and Construction Manager. Any such agreement shall preserve and protect the rights of the Owner, Architect and Construction Manager under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against the Owner. Such agreement shall include acceptance of, and adherence to, the "no damage for delay" clause contained in Section 8.3 of these Supplementary General Conditions. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Section 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to its Sub-subcontractors.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

Modify subsection 6.2.4 as follows:

6.2.4 Delete the word "wrongfully" in the first line.

Add the following subsection 6.2.6:

6.2.6 Should the Contractor cause damage to the work or property of a separate contractor on the Project or other work on the site, the Contractor shall, upon due notice, settle with such other contractor by agreement, if he will so settle. In any other event or circumstance, the provisions of the indemnification section shall apply.

ARTICLE 7 - CHANGES IN THE WORK

7.1 GENERAL

Add the following subsection 7.1.4:

7.1.4 Unit prices, when noted, shall be submitted in the Form of Proposal for the various items set forth therein and shall be used to determine changes in the Contract Sum in connection with extra work or work deleted or reduced by the Architect. The Unit Prices set forth in the Form of Proposal shall include all labor, materials, equipment, insurance, bonds, applicable taxes, overhead and profit and shall apply to all Work added to or subtracted from the Contract.

Add the following subsections 7.3.11, 7.3.12, 7.3.13, and 7.3.14:

7.3.11 The allowance for the combined overhead and profit ("Markup") included in the total cost to the Owner shall not exceed 15%. If Work is performed by Contractor, markup shall not exceed 15%. If Work is performed by Subcontractors, markup for Contractor shall not exceed 5% and markup for Subcontractors shall not exceed 10% of the change order.

7.3.12 Cost to which overhead and profit is to be applied shall be determined in accordance with subsection 7.3.3.

7.3.13 To facilitate checking of quotations for additional Work or deleted Work, all proposals shall be accompanied by a complete itemization of costs including labor, materials, Subcontracts, overhead and profit. Subcontracts shall also be so itemized.

7.3.14 Changes in the Work involving additional work or deletion of Work resulting in an addition to or subtraction from the Contract Sum shall not be effective until the Contractor submits to the Architect the cost of the added or deleted Work with a complete and detailed listing of all Subcontractors involved, all materials, labor, overhead and profit, and the Architect has issued an appropriate Change Order. If requested, the Contractor shall submit detailed

quotations from its own office or from Subcontractors, suppliers or materialmen. Changes in the Work, when not involving additions or deletions in the Contract Sum shall not be made until the Architect has issued an appropriate Change Order or Construction Change Directive. ALL CHANGE ORDERS MUST HAVE APPROVAL OF THE OWNER IN WRITING.

ARTICLE 8 - TIME

8.2 PROGRESS AND COMPLETION

Delete subsections 8.2.1, 8.2.2 and 8.2.3 in their entirety and replace them with the following:

8.2.1 TIME IS OF THE ESSENCE IN THE COMMENCEMENT, PROSECUTION AND CONSTRUCTION OF THE WORK. Contractor shall be responsible for all direct and consequential damages to Owner, Architect and Construction Manager arising from any delay of Contractor, its subcontractors and suppliers, in performing or completing the Work in accordance with the time requirements of Article 8 hereof. The indemnity provisions of Article 3 are applicable to such damages and to claims arising in respect thereto.

8.2.2 Contractor shall do all things necessary to ensure the prosecution of the Work in accordance with any one or more of the following as determined by Construction Manager in its absolute and sole discretion:

.1 Project schedules and revisions thereof, given from time to time by Construction Manager to Contractor;

.2 the time requirements for various portions of Work, which said requirements are made known from time to time by Construction Manager or Other Contractors to Contractor;

.3 the requirements of the project including, but not limited to, coordination requirements as may from time to time be known to Contractor or be made known by Construction Manager or Other Contractors to Contractor;

.4 schedules of the Work provided by Contractor to Construction Manager upon Construction Manager's request.

8.2.3 Should the progress of the Work and/or Other Work be delayed by any fault, neglect, act or failure to act of Contractor or any of its subcontractors or suppliers so as to cause any additional cost, expense, liability or damage to Owner, Architect/Engineer and/or Construction Manager or for which Owner, Architect/Engineer and/or Construction Manager may become liable, Contractor shall hold Owner, Architect/Engineer and/or Construction Manager harmless from

and indemnify Owner, Architect/Engineer and/or Construction Manager against all such additional cost, expense liability or damage in accordance with the provisions of Article 3.

Add the following subsections 8.2.4, 8.2.5, 8.2.6 and 8.2.7:

8.2.4 The Work shall be performed during regular working hours, except that in the event of emergency or when necessary to perform the Work in accordance with the requirements of Subsection 8.2.2, Work shall be performed at Contractor's cost and expense (including Construction Manager's standby and other general conditions costs) on night shifts, overtime, Saturdays, Sundays, Holidays and at other times, if permission to do so has been obtained in writing from Construction Manager. Without limiting the requirements of the preceding sentence, if the progress of the Work or of the Project has been delayed by any fault, neglect, act or failure to act of Contractor or any of its subcontractors or suppliers, Contractor shall work such overtime, at Contractor's cost and expense as aforesaid, as Construction Manager shall deem necessary or desirable to make up for all time lost and to avoid delay in the completion of the Work and of the Project. The failure by Construction Manager to direct Contractor to engage in such overtime work shall not relieve Contractor of the consequences of its delay.

8.2.5 Contractor shall commence the Work only upon written notice by Construction Manager and after the effective date of all Contractor’s insurance.

8.2.6 Construction Manager may direct acceleration of the Work in order that it may be performed in advance of the schedules, time requirements and Project requirements described in Subsection 8.2.2 hereof. If so directed, Contractor shall increase its staff and/or work overtime. Contractor will not be entitled to additional compensation for work performed outside of regular working hours, except as approved by Owner and authorized in writing by Construction Manager. Provided that Contractor is not in default under the Contract, and Construction Manager has issued the aforesaid authorization, there shall be added to the Contract Price as actual out-of-pocket amount equal to: (i) additional wages actually paid, at rates which have been approved by Construction Manager; (ii) taxes imposed by law on such additional wages; (iii) premiums for worker's compensation and liability insurance if required to be paid on such additional wages.

8.2.7 Contractor and its Surety shall be strictly accountable for completion as a condition to satisfactory contractual performance.

8.3 DELAYS AND EXTENSIONS OF TIME

Delete subsections 8.3.1, 8.3.2 and 8.3.3 in their entirety and replace them with the following:

8.3.1 If Contractor claims an increase in the Contract Price or an extension in the completion time requirements by reason of a change in the Work, Contractor shall give Construction Manager written notice pursuant to section 15.1. This notice shall be given by Contractor before proceeding to execute the changed Work, except in an emergency endangering life or property in which case Contractor shall proceed in accordance with section 10.3 of these Conditions. No such claim will be valid unless notice is given as required in this section. Contractor shall proceed to execute the Work, even though the increase or time extension has not been agreed upon.

8.3.2 Should Contractor be obstructed or delayed in the commencement, prosecution or completion of the Work, without fault on its part, by reason of failure to act, direction, order, neglect, delay or default of the Owner, Architect, the Construction Manager, or any other contractor employed on the Project; by changes in the Work including all changes to the contract allowed by the Contract Documents; fire, lightning, earthquake, enemy action, act of God or similar catastrophe; by Government restrictions with respect to materials or labor; or by an industry wide strike beyond Contractor's reasonable control, then Contractor shall be entitled to an extension of time lost by reason of any and all causes aforesaid, but no claim for extension of time on account of delay shall be allowed unless a claim in writing therefore is presented to Construction Manager with reasonable diligence but in any event not later than ten (10) days after the commencement of such claimed delay. Except for the causes specifically listed above in this section 8.3.2, no other cause or causes of delays shall give rise to an extension of time to perform the Work. The granting of an extension of time is conditioned upon Contractor's timely submission of the aforesaid written notice. Except to the extent, if any, expressly prohibited by law, Contractor expressly agrees not to make, and hereby waives, any claim for damages, including those resulting from increased labor or material cost, on account of any delay, obstruction or hindrance for any cause whatsoever, whether or not foreseeable and whether or not anticipated including but not limited to the aforedescribed causes, and agrees that the sole right and remedy therefore shall be extension of time, provided the requisite condition as to written claim has been met.

8.3.3 Contractor shall not be allowed an extension of time unless Contractor has established to the satisfaction of the Owner, Construction Manager and Architect that the delay claimed by Contractor is to a portion of the Work on the critical path of the work schedule.

Add the following subsections 8.3.4, 8.3.5 and 8.3.6:

8.3.4 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

8.3.5 It is emphasized that no monetary recovery may be obtained by Contractor for Delay. Time extensions for delay are limited to the specific causes set forth in

Section 8.3.1 hereof and, then, only upon compliance with the notice and proof requirements of Sections 8.3.2, 8.3.3, 8.3.4 and Article 15 of these conditions.

8.3.6 It is specifically agreed by Contractor that under no circumstances will Contractor look to or make a claim against Owner, Construction Manager or Architect for the consequences of any delay resulting from directions given or not given by Construction Manager including scheduling and coordination of the Work or resulting from Architect's preparation of Drawings and Specifications or review of Shop Drawings.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following subsection 9.2.1:

9.2.1 Schedule of Values:

.1 Contractor shall submit in triplicate to the Construction Manager and the Architect within ten (10) calendar days from the date of award of the Contract the Schedule of Values using the Architect's Payment Application form.

.2 The list of items shall include all items included in all Divisions and Sections of the specifications.

.3 Contractor shall maintain and keep current all changes to the Schedule of Values caused by Change Orders, Construction Change Directives or other authorized changes. Such revised Schedule of Values shall be presented monthly with the Application for Payment.

.4 The following items shall also be listed separately as the line items (with their respective values):

.1 Bond and Project Insurance;
.2 Operations and Maintenance Manuals (including construction record drawings);
.3 Each Allowance associated with the Contract;
.4 Each Alternate accepted;
.5 Each Change Order as it is issued;
.6 Each Construction Change Directive as it is issued; list below the associated allowance;
.7 Mobilization and demobilization, separately;
.8 Warranties.

9.3 APPLICATIONS FOR PAYMENT

Delete subsection 9.3.1 and clauses 9.3.1.1 and 9.3.1.2 in their entirety and replace them with the following:

9.3.1 On or before the 25th of each month during the progress of the Work, Contractor shall submit to Construction Manager an Application and Certificate for Payment in affidavit form, written on AIA Document G732 and continuation sheets, sworn to by a principal officer of Contractor, which shall include the following:

a. the amount paid to Contractor to the date of Application for Payment;

b. the amount requested by Contractor on the current Application for Payment;

c. the balance that will be due after the payment requested is made;

d. any additions to and subtractions from the Contract Price in accordance with the Contract Documents;

e. the amount being withheld for retention; and

f. the percentage of completion of each detailed portion of the Work.

9.3.1.1 Each application for Payment shall provide for a retention required by Owner of five percent (5%) of the amount due until completion of the Work and acceptance thereof by Owner. Contractor shall furnish with each Application for Payment such material invoices, evidence of equipment purchase, rentals and other details of cost as Owner, Owner's construction lender, or Construction Manager may require from time to time.

9.3.1.2 With each application for Payment, Contractor shall submit a duly executed waiver or partial waiver of lien in form approved by Owner, and acknowledged under oath by a principal officer of Contractor. In addition, Contractor shall, with each Application for Payment, furnish an affidavit, in form approved by Owner and acknowledged under oath by a principal officer of Contractor, stating that there are no known mechanics or materialmen liens outstanding at the date of the Application; that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the Application, and except for such bills not paid but so included, there is no known basis for the filing of any mechanics or materialmen liens on the Work; and that all laborers, workmen, and mechanics employed in the performance of the Contract are paid not less than the hourly rates of wages and provided supplements (not less than the prevailing supplements) stated in the Contract Documents.

Add the following clauses 9.3.1.3 and 9.3.1.4:

9.3.1.3 Construction Manager and Architect shall review each Application for Payment and the supporting documentation submitted therewith. Construction Manager and Architect shall then jointly approve, modify or reject, in whole or in part, such Application for Payment. Construction Manager may, at its discretion, either return such Application for Payment to Contractor for revision and resubmission or forward the Application to Owner as approved or as modified unilaterally by Construction Manager and Architect, together with a Certificate for Payment issued by Architect, for such amount as Construction Manager and Architect jointly determine as properly due. The issuance of a Certificate for Payment and/or the forwarding of an Application for Payment to Owner by Architect and Construction Manager shall not bind Owner to make payment, Owner having retained the right to retain payment, in whole or in part, under section 14.2.

9.3.1.4 Payments for stored material shall only be made if Owner specifically approves in writing. If payments are to be made on account of materials and equipment not incorporated in the Work but delivered and suitably stored at the Project site or at some other location agreed upon by Owner and Construction Manager in writing, such payments shall be conditioned upon submission by Contractor of bills of sale and other documents satisfactory to Owner to establish Owner's title to such materials and equipment and to otherwise protect Owner's interests including applicable insurance and transportation to the Project site. All such materials not on the Project site shall be stored locally, segregated from other materials, labeled with the Owner's name and the Project name at a minimum, and fully insured with the Owner named as insured, as more fully described in the Specifications.

Add the following subsection 9.3.4 and clause 9.3.4.1:

9.3.4 Each Application for Payment forwarded to the Owner by the Construction Manager or the Architect shall be subject to audit and approval by Owner in accordance with Owner's normal audit procedures.

9.3.4.1 Upon audit and approval of an Application for Payment, Owner shall pay the amount approved less an amount necessary to satisfy any claims, liens, or judgments against the Contractor which have not been satisfactorily discharged and less retainage of five percent (5%) of the amount approved.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Modify clause 9.5.1.6 as follows:

9.5.1.6 Delete the word "or" at the end of the clause.

Modify clause 9.5.1.7 as follows:

9.5.1.7 Add the word "or" to the end of the clause.

Add the following clause 9.5.1.8 to subsection 9.5.1:

9.5.1.8 any other breach of the Agreement.

9.6 PROGRESS PAYMENTS

9.6.8 Delete the words “Provided the Owner has fulfilled its payment obligations” at the beginning of the first sentence. Capitalize the following word “the.”

9.7 FAILURE OF PAYMENT

Modify subsection 9.7 as follows:

Delete the words "or awarded by binding dispute resolution" in lines four through five. Also in line five, delete the word "seven" and replace it with the word "twenty-one."

9.8 SUBSTANTIAL COMPLETION

Add the following subsections 9.8.6 and 9.8.7:

9.8.6 Contractor shall deliver to Owner, before final payment is made on the Contract, a written Maintenance Guarantee on a photocopy or other facsimile of the form in Section 01740, properly sworn to and signed by a responsible officer of Contractor, guaranteeing all work and materials included in this Contract against all defects not due to ordinary wear and use for a period equal to the greater of one (1) year from the date of Substantial Completion or other such period as may be specified by Legal Requirements or Contract Documents. If any part of the Work is found after Substantial Completion not to comply with Contract Documents, the guarantee period thereof shall commence on the date such work is corrected to comply with the Contract Documents.

9.8.7 Certificate of Substantial Completion shall not be issued until all documents required by the Specifications to be delivered at Substantial Completion are actually delivered in acceptable form to the Construction Manager.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.2 Modify by adding the following at the end:

Owner's attorney's fees including without limitation those incurred as a result of any liens or claims filed with or against the Owner by Contractor's project creditors shall be deducted from the Final Payment otherwise due to the Contractor.

Add the following subsections 9.10.6, 9.10.7, 9.10.8 and 9.10.9:

9.10.6 Contractor shall promptly, after receipt of written notice, correct any defects in materials, equipment and workmanship which may develop within the guarantee period, and also correct and/or repair and/or replace any damage to other work or to Owner's property caused by defective materials, equipment or workmanship and the repairing of same.

9.10.7 Existing guarantees shall not deprive Owner of any action, right or remedy otherwise available for breach of any of the provisions of the Contract Documents. The periods referred to above shall not be construed as a limitation on the time in which Owner may pursue such other action, right or remedy.

9.10.8 Each Contractor shall submit, prior to requesting final inspection, written certification that:

a. Work has been completed in accordance with Contract Documents.

b. Project has been inspected for compliance with Contract Documents.

c. Equipment and systems have been tested in the presence of the Construction Manager and the Owner's Representative and are operational.

d. Owner's designated staff have been instructed on all equipment and systems and an Owner signed receipt furnished the Architect.

e. Operational and Maintenance Manuals have been submitted to and reviewed by the Architect.

f. Owner has been furnished the specified guarantees and spare parts and an Owner signed receipt furnished the Architect.

g. Project has been completed and is ready for final inspection.

9.10.8.1 If the Architect considers the work complete in accordance with the requirements of the contract documents, the Contractor will submit his final requisition together with the following from the contractor and a release of liens from subcontractors
:

a. AIA G706 - Contractor's Affidavit of Payments of Debts and Claims.

b. AIA G706A-1994 - Contractor’s Release of Liens and Waiver of Liens

c. AIA G707 - Consent of Surety to Final Payment.

9.10.8.2 If the Architect does not consider the work finally complete, the Contractor will be notified, in writing, with the reasons stated and the Contractor shall pay the cost of any services or materials charged to the Owner by the Architect and Construction Manager for second and subsequent inspections.

9.10.9 The Contractor shall achieve FINAL COMPLETION of all Work, including correction of punchlist items, preparation and delivery of manuals, presentation of training and completion of final paper submissions not later than sixty (60) days following the Contractor's scheduled Substantial Completion date. In the event the Contractor shall fail to achieve Final Completion in a timely manner in accordance with this subsection 9.10.9, the Contractor and the Contractor's Surety shall be liable for and shall reimburse the Owner for any and all Architecture, attorney, or Construction Manager fees, materials or expenses made necessary by the Contractor's failure. Additional fees and expenses shall be charged by the Owner against any Final Payment due or which may become due the Contractor.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following subsection 10.1.1:

10.1.1 Prevention of accidents at the site is the responsibility of the Contractor, its employees, subcontractors, and suppliers, and all other Contactors, persons, and entities at the site. The Contractor shall establish its own safety program implementing safety measures, policies and standards conforming to those required or recommended by governmental and quasi-governmental authorities having jurisdiction. The Construction Manager is not responsible for identifying unsafe practices, and the Construction Manager's failure to stop the Contractor's unsafe practices, and the Contractor of the responsibility thereof. The Contractor shall indemnify the Construction Manager and the Owner for fines and penalties imposed on the Construction Manager or Owner as a result of safety violations.

10.4 EMERGENCIES

Delete subsection 10.4 in its entirety and replace it with the following:

10.4 In an emergency affecting life, safety, health, the Work, the work of other contractors or the Owner, or Owner's property, Contractor, without special instructions or authorization from Construction Manager, shall take the action necessary to deal adequately with such emergency. Notice of any such action shall be given by Contractor to Construction Manager as soon as is practicable.

Add the following new sections 10.5 and 10.6, as well as subsections 10.5.1, 10.5.2, 10.5.3, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.6.1, 10.6.2 and 10.6.3:

10.5 PROTECTION OF PROPERTY

10.5.1 Contractor shall continuously protect the Work, other work, and the property of the Owner and others from damage, injury or loss arising in connection with the Work. Owner, Architect and Construction Manager shall not be responsible for any loss or damage to the Work, however caused, until after final acceptance thereof by the Owner, nor shall Owner, Architect or Construction Manager be responsible for loss of or damage (however caused) to materials, equipment, appliances and other personal property of Contractor used in the performance of the Work.

10.5.2 Contractor shall protect roadways, streets, sidewalks, paths, hallways, stairways and other common areas, whether or not open to the public, keep them free from obstructions and maintain them in a safe and satisfactory condition. Contractor shall protect trees, shrubs, lawns, landscape work to remain from damage by guards, fences or other necessary methods.

10.5.3 Contractor shall provide, erect and maintain barricades, warning signs, flags, lights, as may be necessary to protect the Work and safeguard the workmen and the general public. All such protection shall comply with the requirements of the proper authorities having jurisdiction.

10.5.4 Contractor shall at all times during the construction period protect the excavation, trenches and the building from damage from water caused by rain, springs, ground water, back-up of drains and sewers, work of or with which is included in his contract, or from any source under his control. Contractor shall provide and maintain pumps and other equipment, coffer dams, ditches and other protection required. Contractor shall construct and maintain all necessary temporary drainage and do all pumping required to keep the excavation, basements and crawl spaces free from water at all times.

10.5.5 If, during construction, public or private property is damaged or destroyed as a result of Contractor's neglect, Contractor shall, at his own expense, restore such property to a condition equal or better than that existing before such damage or injury was done by repairing, rebuilding or replacing it, or otherwise making good such damage or destruction in a manner acceptable to the Owner.

10.5.6 Contractor shall protect his work from damage caused by vandalism and malicious mischief.

10.5.7 Contractor shall enforce Construction Manager's instructions and all Legal Requirements regarding signs, advertisements, fires, smoking, alcoholic beverages, and the possession of firearms at the Project site.

10.6 DISCOVERY OF HAZARDOUS MATERIALS

10.6.1 In the event Contractor, in the course of work or otherwise, encounters material reasonably believed to be asbestos, petroleum or other hazardous or dangerous chemical or substance, Contractor shall immediately cease work in that area and promptly notify Owner, Construction Manager and Architect in writing. Contractor shall not be required to perform work in that area until the hazard, if any, is abated. In the event Contractor stops work pursuant to this section and no such hazardous or dangerous chemical or substance shall be found, no extension of time shall be granted to Contractor. This section shall not apply in the case of asbestos which is to be removed and disposed of as part of the Work of this Agreement.

10.6.2 No product or material containing any asbestos whatsoever shall be incorporated in the Project; Material Safety Data Sheets for all materials incorporated into the Project shall be delivered to the Construction Manager prior to or upon delivery to the site. Materials for which no Material Safety Data Sheets have been provided to the Construction Manager shall be removed from the Project site at the Contractor's expense.

10.6.3 In the event Contractor, in the course of work or otherwise, encounters material reasonably believed to be or assumed to be lead-based paint, Contractor shall immediately cease work in that area and promptly notify Owner, Construction Manager and Architect in writing. Contractor shall then follow *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, June 1995, known as the "HUD guidelines", and EPA requirements, including the Lead Abatement Report.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE AND BONDS

Delete subsections 11.1.2, and 11.1.3 in their entirety and replace with the following:

11.1.2 Contractor shall deliver to the Owner prior to the execution of the Contract, an executed Performance Bond and Labor and Material Payment Bond each in the amount of one hundred percent (100%) of the Contract Sum. The Bonds shall be written by a company licensed to sell surety insurance in the State of New York and acceptable to the Owner. Contractor shall use an unaltered AIA Document A311 1970 Edition. The Attorney-in-Fact who executes these bonds on behalf of the surety is to affix thereto a certified and current copy of the Power of Attorney.

11.1.3 No Work shall commence until the Owner has accepted the Bonds. The Owner shall have the right to reject the Contractor for the Contractor's failure to comply and the Contractor shall forfeit any bid security for failure to comply with bonding or insurance requirements.

In section 11.1.4, add the following:

In the third line, after the words "Contract Documents," add the words "and no later than ten (10) business days before the expected date of cancellation,"

In the third line, after the words "the Contractor shall provide," add the word "written."

Add new subsections 11.1.5, 11.1.6 11.1.7, 11.1.8, 11.1.9, 11.1.10, 11.1.11, 11.1.12, 11.1.13 and 11.1.14:

11.1.5 The Contractor shall purchase from and maintain in a company licensed to sell insurance in New York State occurrence based insurance as will protect the Contractor from claims set forth in subsection 11.1.6 below, which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. At the sole discretion of the Owner, Contractor may purchase such liability insurance from a risk retention group; provided, however, that the liability insurance provided by such risk retention group shall fully protect the Contractor from claims set forth in subsection 11.1.6 below, which may arise out of or result from the Contractor's operations under the Contract or from that of a Subcontractor or from anyone directly or indirectly employed by any of them.

11.1.6 The liability insurance required in subsection 11.1.5 shall protect the Contractor against the following:

.1 claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 claims for damages because of bodily injury, occupation sickness or disease, or death of the Contractor's employees;

.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

.5 claims for damages, other than to the Work itself, because of injury, death of a person or property damage arising out of the ownership, maintenance or use of a motor vehicle; and

.6 claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

11.1.7 The insurance required by subsection 11.1.5 shall be on a comprehensive basis and may be provided by a Commercial General Liability or a Comprehensive General Liability policy. Exclusions of any category of insurance must be noted on the Certificate of Insurance prepared for this Project; provided, however, that the insurance required by subsection 11.1.5 shall include all of the following major divisions of coverage:

.1 Premises-Operations (including X-C-U);

.2 Independent Contractor's Protective;

.3 Products and Completed Operations;

.4 Personal Injury Liability;

.5 Contractual -- including specified provision for the Contractor's Obligations under section 3.18;

.6 Owned, Non-Owned and Hired Motor Vehicles; and

.7 Broad Form Property Damage including Completed Operations.

11.1.8 The insurance required by subsection 11.1.5 shall be provided on an occurrence basis only, with no sunset clauses. The Coverages shall be maintained without interruption from date of commencement of the Work until the date of final payment or later, for those coverages required by the Contract to be maintained after final payment. The Contractor shall include the Owner, Architect and Construction Manager as additional insureds. Additional insured status shall be on a primary and noncontributory basis, and it shall be provided by ISO additional insured endorsement CG 20 10 11 85 or equivalent.

11.1.9 The insurance required by subsection 11.1.5 shall be written for not less than the following limits, or greater if required by law:

.1 Worker's Compensation and New York State Disability:

(a) State: Statutory

(b) Applicable Federal
(e.g., Longshoremen's): Statutory

(c) Employer's Liability: Statutory

.2 Contractual Liability: Bodily Injury, Property Damage and Contractual Liability

(a) General Aggregate $2,000,000

(b) Products and Completed Operation to be maintained for two (2) years after Owner's acceptance at final payment:

$2,000,000.00 Aggregate

(c) Property Damage Liability Insurance shall provide X, C, and U coverage.

(d) Broad Form Property Damage Coverage shall include Completed Operations.

(e) Personal and Advertising Injury $1,000,000

(f) Each Occurrence $1,000,000

(g) Fire Damage $50,000

(h) Medical Expense $5,000

.3 Business Auto Liability (including owned, non-owned, and hired vehicles): $1,000,000.00 combined single limit.

.4 If the General Liability coverages are provided by a Commercial Liability policy, the:

(a) General Aggregate, including Products/Completed Operations, shall be not less than $2,000,000.00 and it shall apply, in total, to this Project only.

(b) Fire Legal Liability Limit shall be not less than $50,000.00 on any one fire.

(c) Premises Medical Payments Limit shall be not less than $5,000.00 on any one person.

.5 Aircraft Liability (owned and non-owned) when aircraft are used in the performance of the Contract: $2,000,000.00. (if applicable)

.6 Watercraft Liability (owned and non-owned) when watercraft are use in the performance of the Contract: $2,000,000.00. (if applicable)

.7 Umbrella/Excess Liability:

$5,000,000.00 over primary insurance, on a follow form basis.
$50,000.00 retention for self-insured hazards, each occurrence.

.8 Asbestos Abatement Coverage

For Contracts involving asbestos abatement: In addition to coverages noted above, Asbestos Liability Insurance, in a form acceptable to the Owner and written by an insurance company acceptable to the Owner, shall be provided prior to the commencement of the Work. With coverage for the services rendered for the district, including, but not limited to removal, replacement enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party claims for bodily injury, property damage and clean-up costs.

$1,000,000 per occurrence and $2,000,000 aggregate, including products and completed operations. If retroactive date is used, it must pre-date the inception of the Contract.

If the Contractor is using motor vehicles for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948 or equivalent) as well as proof of MCS 90.

11.1.10 Certificates of Insurance acceptable to the Owner shall be filed with the Construction Manager prior to commencement of the Work. These Certificates and the insurance policies required by section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least thirty (30) days' prior written notice has been given to the Owner. The Certificates shall be written on an ACORD Form 25S and accompanied by AIA Form G715. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional Certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by subsection 9.10.2. Information concerning reduction in coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief. In addition to the Certificate of Insurance, the Contractor shall provide the Owner with copies of any endorsement subsequently issued amending coverage or limits.

11.1.11 No Contractor shall commence work under this Contract until he has obtained all the insurance required hereunder and until such insurance has been accepted by the Owner, nor on his Subcontractor until all similar insurance required of the Subcontractor has been so obtained.

11.1.12 The insurance required by subsection 11.1.6 shall be written to name Owner, Construction Manager and Architect as additional insured parties and this designation shall appear on all Certificates of Insurance.

11.1.13 The Contractor shall purchase and maintain, from a company licensed to sell insurance in New York, an Owner's and Contractor's Protective Liability (OCP) Policy in the name of the Owner and covering the interests of the Owner with coverage limit of no less than $1,000,000 per occurrence.

11.1.14 Off Site Storage and Risk of Loss

.1 The Owner shall provide insurance coverage for portions of the Work stored off site only after written approval of the Owner, at the value established in the approval, and also for portions of the Work in transit.

.2 Risk of loss or damage to boiler and machinery shall pass from the Contractor to the Owner no earlier than the date of written acceptance of such boiler and machinery by the Owner, after installation.

11.3 WAIVERS OF SUBROGATION

Modify subsection 11.3.1 as follows:

11.3.1 At the end of the subsection, add the following:

In waiving the rights of recovery under the terms of this subsection, the term "Owner" shall be deemed to include its employees, and the Architect and Construction Manager and their employees as the Owner's representatives, as provided in the Contract Documents. The policies shall be endorsed to include waiver of subrogation.

11.5 ADJUSTMENT AND SETTLEMENT OF AN INSURED LOSS

Add the following new subsection 11.5.3:

11.5.3 If an action for bodily injury and/or property damage is commenced against Owner, Architect or Construction Manager, which in the opinion of Owner's, Architect's or Construction Manger's legal counsel or insurance coordinator is covered by the indemnity provisions of Section 3.18, Contractor shall, upon Construction Manager's or Owner's written request, promptly cause Contractor's insurance carrier to have its attorneys appear timely in the action on behalf of Owner and/or Architect and/or Construction Manager and provide the defense of Owner and/or Architect and/or Construction Manager.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Delete subsection 13.1 in its entirety and replace with the following new subsections and clauses 13.1.1, 13.1.2, 13.1.2.1, 13.1.2.2 and 13.1.3:

13.1.1 The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules.

13.1.2 Specific reference is made to the following sections of the Labor Law and General Municipal Law which apply to the Work under this Contract.

13.1.2.1 Labor Law

.1 Section 201-g. Anti-sexual harassment training.

Contractor Certifies that 1) it has implemented a written policy addressing sexual harassment prevention in the workplace, and 2) that it provides annual sexual harassment prevention training to all of its employees.

In addition, by submitting a bid on this project, contractor agrees to cooperate with school officials in any fair and confidential investigation of sexual harassment incidents in which due process rights are retained. Employees or subcontractors credibly accused of sexual harassment shall be offered a reasonable opportunity to respond to any claims. Those who refuse to take part in the investigation shall be barred from the site.

.2 Section 220; subd. 2, re: 8 hour day, 40 hour week.

.3 Section 220, subd. 3 and 220-d, re: Minimum Wage Rates and Supplements, which are included in these specifications.

.4 Section 220, subd. 3-a. Minimum Wage Rates.

Every contractor, and sub-contractor, shall submit to the Owner, within thirty days after issuance of its first payroll, and every thirty days thereafter, a transcript of the original payroll record, as provided by the Labor Law, subscribed and affirmed as true under the penalties of perjury.

.5 Section 220-e, re: Anti-discrimination, including all subparts.

.6 Section 222-a, re: Prevention of dust hazards.

13.1.2.2 General Municipal Law

.1 Section 103-d, re: Non-collusion.

Contractor agrees, pursuant to General Municipal Law §103-d, to subscribe and affirm the following statement:

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:

a. The prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor.

b. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and

c. No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

.2. Section 108, re: Workers' Compensation Insurance.

This Contract shall be void and of no effect unless the person or corporation making or performing such contract shall secure compensation for the benefit of, and keep insured during the life of the contract, such employees, in compliance with the provisions of the Workers' Compensation Law.

.3 Section 109, re: Non-assignment of Public Contracts.

As provided in Section 109 of the General Municipal Law, the Contractor is prohibited from assigning, transferring, conveying, subletting or otherwise disposing of the same, or his right title, or interest therein, or his power to execute such contract or any other person or corporation without the previous consent in writing of the officer, board or agency awarding the contract. If any contractor, to whom any contract is let, granted and awarded, as required by law, by any officer, board or agency in a political subdivision, or of any district therein, shall without the previous written consent specified in subdivision 1 of this section, assign,

transfer, convey, sublet or otherwise dispose of such contract, or his right, title or interest therein, or his power to execute such contract, to any other person or corporation, the officer, board or agency which let, made, granted, or awarded such contract shall revoke and annul such contract, and the political subdivision or district therein, as the case may be, and such officer, board or agency shall be relieved and discharged from any and all liability and obligations growing out of such contract to such contractor, and to the person or corporation to which such contract shall have been assigned, transferred, conveyed, sublet or otherwise disposed of, and such contractor, and his assignees, transferees or sublessees shall forfeit and lose all monies, theretofore earned under such contract, except so much as may be required to pay his employees. The provisions of this section shall not hinder, prevent, or affect any assignment by any such contractor for the benefit of his creditors made pursuant to the laws of this state.

13.1.3 In the event a dispute arises out of this Contract or which in any way affects the rights of any of the parties to it, the Contractor agrees to bring any action, proceeding or other legal process only in the New York State Supreme Court in the county in which the project is located and in no other forum.

13.2 SUCCESSORS AND ASSIGNS

Modify subsection 13.2.1 as follows:

13.2.1 In lines three and four of this subsection delete the words "Neither party to the Contract shall assign the Contract as a whole without written consent of the other" and replace them with the words "The Contractor shall not assign the Contract".

Delete the last sentence and replace it with the following: “If the Contractor attempts to make such an assignment, Contractor shall nevertheless remain legally responsible for all obligations under the contract.”

13.5 INTEREST

Delete section 13.5 in its entirety and replace with "Interest claimed to be due for any late payment shall be made at the rates and under the circumstances set forth in New York General Municipal Law § 106-b."

Add the following new sections 13.6 and 13.7 and subsections 13.6.1, 13.6.2, 13.6.3, 13.7.1 and 13.7.2:

13.6 WAIVER AND LIMITATIONS PERIODS

13.6.1 The failure of Owner, Construction Manager or Architect to insist upon performance or strict performance of any of the terms, covenants or conditions of

the Contract shall not be deemed a waiver of any rights or remedies that Owner may have; shall not be deemed to constitute an amendment of the Contract; and shall not be deemed a waiver of any subsequent breach or default by Contractor of any of the terms or conditions of the Contract.

13.6.2 The Contract may not be amended or any term or provision waived except in writing signed by Owner. Without limitation, no term or provision of the Contract may be amended or waived by conduct of the parties.

13.6.3 Contractor acknowledges that (i) Construction Manager is acting solely as agent and not as a principal; (ii) all services rendered and instructions issued by Construction Manager, within the scope of its authority, are solely as agents for Owner and for Owner's benefits; (iii) there is no privity of contract between Contractor and Construction Manager; and (iv) there are no duties of any kind whatsoever owed by Construction Manager to Contractor. To the maximum extent permitted by law, under no circumstances will Contractor look to or make a claim against Construction Manager. It is acknowledged that the relationship created by the Contract is solely between Owner and Contractor.

13.7 EQUIVALENTS

13.7.1 In the Specifications, where two or more kinds, types, brands, or manufacturers of materials are named, they are regarded as the required standard of quality and are presumed to be equal. The Contractor may select one of these items or, if the Contractor desires to use any kind, type, brand or manufacturer or material other than those named in the Specifications, Contractor shall indicate, in writing, in accordance with the procedures outlined, what kind, type, brand or manufacturer is proposed. The risk of whether items will be approved as equivalents shall be borne by the Contractor.

13.7.2 In the Specifications, the absence of an “or equal” clause is not meant to exclude competition.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.2 TERMINATION BY THE OWNER FOR CAUSE

Modify subsection 14.2.2 as follows:

14.2.2 After the words "seven days” insert the word “written." In line four, after the words “seven days written notice” add the words "or three days written notice, if the number of days between date of commencement and date of substantial completion, including both those days, in Article 2 of the Agreement, is thirty (30) calendar days or less."

Add the following clause to subsection 14.2.3:

14.2.3.1 The Owner, in its sole discretion, may withdraw such termination letter at any time within the seven-day period in the event the Contractor commences and diligently continues a cure of the defects giving rise to the termination letter, by giving written notice to the Contractor of its withdrawal. Such withdrawal shall not prejudice the rights of the Owner to issue another termination letter or any other rights or remedies the Owner may have.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

Add the following subsections and clauses 14.3.3, 14.3.3.1, 14.3.3.2, 14.3.3.3, and 14.3.4:

14.3.3 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

14.3.3.1 Cease operation as directed by the Owner in the notice;

14.3.3.2 Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

14.3.3.3 Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing Subcontracts and purchase orders.

14.3.4 In case of such termination of the Owner's Convenience, the Contractor shall be entitled to receive payment from the Owner on the same basis provided in subsection 14.1.2.

ARTICLE 15 – CLAIMS AND DISPUTES

Modify subsection 15.1.3 as follows:

15.1.3 NOTICE OF CLAIMS

Modify subsection 15.1.3.1 as follows:

15.1.3.1 In the second line, insert the word “written” before the word “notice.”

Modify subsection 15.1.3.2 as follows:

15.1.3.2 In the second line, insert the word “written” before the word “notice.”

Add the following clauses 15.1.3.3, 15.1.3.4, 15.1.3.5, 15.1.3.6, 15.1.3.7 and 15.1.3.8 at the end of the subsection:

15.1.3.3 Notice of Claim shall be sufficiently detailed and descriptive to allow investigation and resolution.

15.1.3.4 If the Contractor shall claim to be sustaining damages (either monetary or for which the Contractor seeks an extension of time to complete), for any reason, including without limitation, damages for delay, changed conditions by reason of any act or omission of the Owner or its agents, he shall within five (5) days after such act, loss, damage or omission occurs, notify the Owner and Architect in writing, and within thirty (30) days thereafter, or within such additional time in excess of thirty (30) days as may be granted by the Owner upon written request therefore, submit to the Owner verified detailed statements of the damages sustained together with documentary evidence of such damages. Upon failure of the Contractor to fully comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist.

15.1.3.5 All written claims for additional cost, additional time, or damages shall include the time of occurrence, location and other identifying factors and shall be supported, at a minimum, by letters, journals and diaries, instructions or other pertinent and applicable records, as the Architect, Construction Manager and Owner may require.

15.1.3.6 Claims, including those alleging an error or omission by the Construction Manager or Architect, shall be delivered to the Construction Manager, with copies to the Architect and Owner, for initial action by the Construction Manager in accordance with Article 15. Presentation, investigation and non-binding mediation of any claim pursuant to this Article 15 shall be a condition precedent to litigation of a claim by the Contractor against the Owner as to all such matters arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work, or (2) the extent to which the Work has been completed.

15.1.3.7 Notice to the Contractor by the Owner, Architect, Construction Manager or other Owner's Representative of a Claim in the course of a Project Meeting shall be sufficient notice of a Claim of injury or damage to person or property to meet the requirements of this Article 15.

15.1.3.8 While the Contractor or its Subcontractor is performing Extra Work ordered by the Owner (unless payment therefore is to be made by a lump sum or at unit prices previously agreed upon) or is performing disputed Work or complying with a determination or order under protest in accordance with this Agreement, in each such case the Contractor shall furnish the Construction Manager daily with three copies of written statements signed by the Contractor's representatives at the site showing:

(1) the name and number of each workman employed on such Work or engaged in complying with such determination or order, the number of hours employed

thereon, and the character of work each is doing; and

(2) the nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such Work or compliance with such determination or order, and from whom purchased or rented.

Failure to comply strictly with these requirements shall constitute a waiver of any claim for extra compensation or damages on account of the performance of such Work or compliance with such determination or order.

15.1.7 WAIVER OF CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete subsection 15.1.7 in its entirety from this Agreement.

15.2 INITIAL DECISION

Delete subsection 15.2.2 and replace it with the following:

15.2.2 The Construction Manager shall review claims and take one or more of the following preliminary actions within fourteen (14) days following written notice of the Claim:

a. Recommend denial of the Claim in writing to the Architect, delivering any materials received from the Claimant or collected in his investigation;

b. Recommend approval of the Claim in writing to the Architect, delivering any materials received from the Claimant or collected in his investigation;

c. Request, in writing, more information from the Claimant, which the Claimant shall provide within seven (7) days following delivery of the request; and/or

d. Attempt to negotiate, modify or settle the claim directly with the Contractor.

Add subsection 15.2.2.1

15.2.2.1. Upon receipt of a Claim and relevant materials and a recommendation from the Construction Manager, the Architect shall take one or more of the following actions within fourteen (14) days following receipt:

.1 Deny the claim;

.2 Approve the claim and recommend approval to the Owner;

.3 Request additional information from the Claimant which the Claimant shall provide within seven (7) days following delivery of the request; and/or

.4 Attempt to negotiate, modify or resolve the Claim with the Contractor and the Construction Manager.

Add the following subsections 15.2.9, 15.2.10, and 15.2.11

15.2.9 If the Claim has been resolved and the resolution accepted by the Owner, the Architect will prepare or obtain appropriate documentation.

15.2.10 If a Claim has not been resolved after following the procedures set forth in these Article 15 subsections, Claimant may demand, by delivery of written notice within ten (10) calendar days of the Architect's decision, to Construction Manager, Architect and Owner, mediation administered by the American Arbitration Association under its Commercial Mediation Rules or other acceptable mediator or mediation service in accordance with §15.4. Choice of the mediator shall be at the discretion of he Owner. Such mediation shall be held within sixty (60) days from receipt of Claimant's written notice. A representative of the involved Contractor(s), Construction Manager, Architect and Owner, each with adequate authority to settle the dispute, shall be present at all sessions or caucuses.

The cost shall of such mediation shall be borne equally by the Owner and Contractor.

15.2.11 Whether or not Architect, Construction Manager, Contractor or Owner accept the position or recommendation of the mediator, or whether the dispute is settled or not, presentation, investigation and mediation of any Claim, whether for a change in contract sum or a change in contract time, or both, for whatever cause, reason or justification, shall be a condition precedent to litigation by the Architect, Construction Manager or Contractor against the Owner.

15.4 ARBITRATION

Delete section 15.4 in its entirety and any reference to arbitration wherever it appears in this Agreement and replace section 15.4 with the following:

15.4.1 Initial Dispute Resolution. If a dispute arises out of or related to this Agreement, or its breach the Owner and Architect Agreement, or the Owner and Contractor Agreements for this Project, or the breach of any of those Agreements, after initial decision by the Architect or thirty days after the submission of the claim to the Architect (or thirty days after submission of the Architect's claim or the Construction Manager's claim to the Owner), the parties shall endeavor to settle the dispute first through direct discussion. If the dispute can not be settled

through direct discussions, the parties shall endeavor to settle the dispute by mediation under the Construction Industry Mediation Rules of the American Arbitration Association or other dispute resolution services acceptable to the parties. The location of the mediation shall be the location of the Project. Once a party files a request for mediation with the other party or parties and with the American Arbitration Association or other service, the parties agree to conclude such mediation within sixty (60) days of filing the request. At least five days prior to the initial mediation, the claimant shall provide to all other parties written documents which describe the nature and amount of the claim, the way in which it arose, supporting documents describing in detail all costs or damage which constitute the claim, the truth of which is sworn to and notarized, sufficient to allow resolution of the claim. Presentation, investigation and mediation of any claim shall be a condition precedent to commencement of any action or proceeding against the Owner. Costs shall be borne equally by the parties. Each party shall have in attendance at any such mediation session a person with sufficient authority to resolve any dispute or settle any claim mediated. Agreements between Owner and Contractor, Owner and Architect, and Owner and Construction Manager (if there is one) shall include this dispute resolution clause and each party to such agreement shall have the same duties under those separate agreements which the Owner and Architect have under this Agreement and shall be available for multi-party mediation pursuant to this section. Strict compliance with this mediation provision shall be a condition precedent to any litigation by the Architect, Construction Manager or Contractor against the Owner. Failure to comply strictly with this dispute resolution provision shall be deemed a waiver of those claims against the Owner.

15.4.2 Work Continuance and Payment. Unless otherwise agreed in writing, the Owner and Contractor shall continue to perform under this Agreement during any non-judicial dispute resolution proceedings. If the Construction Manager continues to perform, the Owner shall continue to make payments in accordance with this Agreement.

15.4.3 In the event a dispute arises out of this Contract or which in any way affects the rights of any of the parties to it, which has not been resolved by mediation as set forth in this Article 8, the Contractor agrees to bring any action, proceeding or other legal process only in the State court jurisdiction in which the project is located and in no other forum.

-END OF SUPPLEMENTARY GENERAL CONDITIONS-

AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor, *Construction Manager as Adviser Edition*

AGREEMENT made as of the day of in the year
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

and the Contractor:
(Name, legal status, address, and other information)

for the following Project:
(Name, location, and detailed description)

The Construction Manager:
(Name, legal status, address, and other information)

The Architect:
(Name, legal status, address, and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS
EXHIBIT B DETERMINATION OF THE COST OF THE WORK

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

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§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:

(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:

(Check the appropriate box.)

[ ] Stipulated Sum, in accordance with Section 4.2 below

[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

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Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

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§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price
§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates
§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

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§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

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§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;

.2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

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§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

.1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;

.2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

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.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

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§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[ ] Litigation in a court of competent jurisdiction.

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[ ] Other: *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

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§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

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§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[ ] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:

(Insert the date of the E235-2019 incorporated into this Agreement.)

[ ] The Sustainability Plan:

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Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

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SUPPLEMENTARY CONDITIONS TO AIA DOCUMENT A132/CMa (2019 EDITION) STANDARD FORM OF AGREEMENT BETWEEN OWNER & CONTRACTOR DATED _____BETWEEN _____ ("OWNER") AND _____("CONTRACTOR")

The Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, AIA Document A132/CMa, 2019 Edition, Articles 1 through 9 inclusive, 15 pages ("Owner and Contractor Agreement") is hereby designated as one of the Contract Documents, and shall govern the Work under this Contract.

SUPPLEMENTARY CONDITIONS

The Supplementary Conditions set forth here are likewise designated one of the Contract Documents, and amend and supplement, and in some cases, void portions of the Owner and Contractor Agreement as set forth here and except as amended and supplemented (or voided) the Owner and Contractor Agreement shall remain in full force and effect. The article numbers set forth in the Supplementary Conditions correspond to (or are in addition to) the article numbers set forth in the Owner and Contractor Agreement.

1. Table of Articles:

ARTICLE 3
DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

2. Article 3, Section 3.2: Add the following to this section 3.2:

   Time is the essence of the commencement, progress and substantial and final completion of the Work of this Agreement.

3. Article 3, Section 3.3.1: Add milestone dates as may be required and substantial completion date.

4. Article 3, Section 3.4.3: Section 3.4.3 shall be deleted in its entirety from this Agreement.

ARTICLE FOUR
CONTRACT SUM

5. Article 4, Section 4.2.2.2: Section 4.2.2.2 shall be deleted in its entirety from this Agreement.

6. Article 4, Section 4.3: Section 4.3 shall be deleted in its entirety from this Agreement.

7. Article 4, Section 4.4: Section 4.4 shall be deleted in its entirety from this Agreement.

8. Article 4, Section 4.5: At the end of the section, add the word “none.”

ARTICLE 5
PAYMENT

9. Article 5, Section 5.1.4.5: Add the following language at the end of this Clause 5.1.4.5:

Owner shall make no payment after the scheduled date of Substantial Completion until the actual date of Substantial Completion.

10. Article 5, Section 5.1.2: At the end of this section 5.1.2, delete the words "monthly, or as follows" and replace them with the word "monthly."

11. Article 5, Section 5.1.3: Fill in the blanks as follows:

Lines two and three: "Contractor not later than the 30th day of the next month"

Line four: "not later than 45 days after the Construction Manager receives"

12. Article 5, Section 5.1.5: Section 5.1.5 shall be deleted in its entirety from this Agreement

13. Article 5, Section 5.1.6: Section 5.1.6 shall be deleted in its entirety from this Agreement.

14. Article 5, Section 5.1.7.1: Section 5.1.7.1, in the first sentence, replace the words "the following amount, as retainage, from the payment otherwise due:" with "five percent (5%), as retainage, from the payment otherwise due."

15. Article 5, Section 5.1.7.3: Add the following to this section 5.1.7.3:

When the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment of Retainage except for an amount equal to two times the value of incomplete and defective work.

16. Article 5, Section 5.2.2: Section 5.2.2 shall be deleted in its entirety from this agreement.

17. Article 5, Section 5.3: Add the following at the end of this Section 5.3: "Any interest claimed due shall be paid in accordance with General Municipal Law § 106-b."

ARTICLE 6
DISPUTE RESOLUTION

18. Article 6, Section 6.1: Section 6.1 shall be deleted in its entirety and replaced with the following Section:

6.1 Initial Decision Maker. The Architect shall serve as initial decision maker for construction claims raised by the Contractor, and the Architect shall serve as initial decision maker for design claims raised by the Contractor, pursuant to Article 15 of AIA Document A232-2019.

19. Article 6, Section 6.2: Delete Section 6.2 in its entirety and replace it with the following:

6.2.1 Initial Dispute Resolution. If a dispute arises out of or related to this Agreement, or its breach, for this Project, after initial decision by the Contractor or thirty days after the submission of the claim to the Construction Manager or Architect (or thirty days after submission of the Contractor's claim or the Construction Manager's claim to the Owner), the parties shall endeavor to settle the dispute first through direct discussion. If the dispute can not be settled through direct discussions, the parties shall endeavor to settle the dispute by mediation under the Construction Industry Mediation Rules of the American Arbitration Association or other dispute resolution services acceptable to the parties. The location of the mediation shall be the location of the Project. Once a party files a request for mediation with the other party or parties and with the American Arbitration Association or other service, the parties agree to conclude such mediation within sixty (60) days of filing the request. At least five days prior to the initial mediation, the claimant shall provide to all other parties written documents, in compliance with the requirements of the Agreement which describe the nature and amount of the claim, the way in which it arose, supporting documents describing in detail all costs or damage which constitute the claim, the truth of which is sworn to and notarized, sufficient to allow resolution of the claim. Presentation, investigation and mediation of any claim shall be a condition precedent to commencement of any action or proceeding against the Owner. Costs shall be borne equally by the parties. Each party shall have in attendance at any such mediation session a person with sufficient authority to resolve any dispute or settle any claim mediated. Agreements between Owner and Contractor, Owner and Architect, and Owner and Construction Manager (if there is one) shall include this dispute resolution clause and each party to such agreement shall have the same duties under those separate agreements which the Owner and Contractor have under this Agreement and shall be available for multi-party mediation pursuant to this Section. Strict compliance with this mediation provision shall be a condition precedent to any litigation by the Architect, Construction Manager or Contractor against the Owner. Failure to comply strictly with this dispute resolution provision shall be deemed a waiver of those claims against the Owner.

6.2.2 Binding Dispute Resolution. Any Claim subject to, but not resolved by mediation pursuant to this Article Section 6.2.1 above, will be resolved by litigation in a New York State Supreme Court in the county where the project is located, unless the Owner and Contractor agree in writing to a binding dispute resolution other than litigation.

20. Article 7, Section 7.2: Section 7.2 shall be deleted in its entirety from this Agreement.

ARTICLE 8
MISCELLANEOUS PROVISIONS

21. Article 8, Section 8.4: Section 8.4 shall be deleted in its entirety and replaced with the following Section:

8.4 The Contractor's representative shall not be changed without ten days' prior written notice to the Owner.

22. Article 8, Section 8.5.1: Section 8.5.1 shall be deleted in its entirety and replaced with the following:

The Contractor shall purchase and maintain insurance and bonding in accordance with the requirements of AIA A232 (2019), Article 11 and A232 (2019) Article 11, supplementary conditions. The Contractor shall not commence Work until all insurance and bonds are reviewed and accepted by the Owner.

23. Article 8, Section 8.7: Section 8.7 shall be deleted in its entirety from this Agreement.

24. Article 8, Section 8.8: In the event this Agreement includes "piggybacking," it is entered into as an exception to the competitive bidding requirements of General Municipal Law ("GML") §103(1), under GML §103(16). That statute requires strict and transparent adherence to both the statute and the Owner's non-bid purchasing policy. Contractor understands and agrees that failure to abide by the statute and policy could jeopardize New York State Aid for the project or could halt the progress of the project. As described on the supplementary general conditions (at §3.1.4), failure to respond to requests concerning the statute or the policy will be considered a default, which could ultimately result, without cure, in termination for cause.

25. Article 9, Section 9.1.8: Check the box labeled "Supplementary and other conditions of the Contract" and title the document "AIA A232 (2019) Supplementary General Conditions March 2025"

- END OF SUPPLEMENTARY CONDITIONS -

DRAFT

AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor,
Construction Manager as Adviser Edition

AGREEMENT made as of the « » day of « » in the year « »

BETWEEN the Owner:

« »« »
« »
« »
« »

and the Contractor:

« »« »
« »
« »
« »

for the following Project:

« »
« »
« »

The Construction Manager:

« »« »
« »
« »
« »

The Architect:

«King + King Architects, LLP »« »
«358 West Jefferson Street »
«Syracuse, NY 13202 »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« X»] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

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« »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[«X »] By the following date: « »

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete
N/A	

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[«X »] Stipulated Sum, in accordance with Section 4.2 below

[« »] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[« »] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
N/A	

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

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Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

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« »

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price

§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed « » ($ « »), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates

§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

« »

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

« »

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§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the « last » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the «Thirtieth 30 » day of the «Next » month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Forty-five » («45 ») days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

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§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

- **.1** The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;
- **.2** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- **.3** The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;
- **.5** The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- **.6** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

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§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

- **.1** That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;
- **.2** That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- **.4** The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

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.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

»

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

« »

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§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« »

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« »

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[« »] Litigation in a court of competent jurisdiction.

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[« »] Other: *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

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§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with a building information modeling, if completed, or as otherwise set forth below:

(If other than in accordance with a building information modeling, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

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§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

.4 Drawings

Number	Title	Date
Refer to the attached Index, Exhibit C, all of which drawings listed therein are incorporated herein by reference		

.5 Specifications

Section	Title	Date	Pages
Refer to attached Index, Exhibit C, all of which specifications sections listed therein are incorporated therein by reference.			

.6 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.7 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[« »] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

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Title	Date	Pages

[« X »] Supplementary and other Conditions of the Contract:

Document	Title	Date
AIA A232 (2019) AIA A132 (2019) – Exhibit D	Supplementary General Conditions Supplementary Conditions	March 2025 August 2024

.8 Other documents, if any, listed below:

« » Exhibit B – Bid Form
Exhibit E – Wage Rates

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*

« »« »

(Printed name and title)

CONTRACTOR *(Signature)*

« »« »

(Printed name and title)

DRAFT

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AIA® Document A132™ – 2019 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month, and year.)

for the following **PROJECT**:
(Name and location or address)

« »
« »

THE OWNER:
(Name, legal status, and address)

« »« »
« »

THE CONTRACTOR:
(Name, legal status, and address)

« »« »
« »

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A232™–2019, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A232™–2019, General Conditions of the Contract for Construction. Article 11 of A232™–2019 contains additional insurance provisions

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§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to false work and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's, Construction Manager's, and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

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(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach,

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including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

« »

[« »] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies. Copies of Additional Insured and Waiver of Subrogation endorsements shall be attached.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
Completed Operations coverage must be maintained for 2 years after the completion of the job.

« »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than six million dollars ($ 6,000,000) each occurrence, seven million dollars ($7,000,000) general aggregate, and seven million dollars ($7,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

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.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
.3 Claims for bodily injury other than to employees of the insured.
.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
.8 Claims related to roofing, if the Work involves roofing.
.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
.10 Claims related to earth subsidence or movement, where the Work involves such hazards.
.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.
.12 **Claims relating to NY Labor Law or Over-Action suits**

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than two million dollars ($ 2,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than one million dollars ($1,000,000) each accident, one million dollars ($1,000,000) each employee, and one million dollars ($1,000,000) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than two million dollars ($2,000,000) per claim four million dollars ($4,000,000) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than two million dollars ($2,000,000) per claim and four million dollars ($4,000,000) in the aggregate.

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§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than three million dollars ($3,000,000) per claim and six million dollars ($6,000,000) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than one million dollars ($1,000,000) per claim and one million dollars ($1,000,000) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than one million ($1,000,000) per claim and one million ($1,000,000) in the aggregate.

$A.3.2.13 Insurance for Cyber Security if such work involves access to the owners computer systems or any personal identifiable information maintain by the owner with policy limits of not less than two million dollars ($2,000,000) per claim and two million dollars ($2,000,000) in the aggregate

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] **§ A.3.3.2.1** If there is only one Contractor performing the Work on the Project, property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than one million dollars ($1,000,000) per claim and one million dollars ($1,000,000) in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than two million dollars ($2,000,000) , storage, transportation, and disposal of asbestos-containing materials.

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[« »] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond
The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	« »
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS
Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« »

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SELECTED AIA DOCUMENTS

Contractors are required to obtain and use the following AIA documents, which can be ordered directly from the American Institute of Architects, at http://www.aia.org/contactdocs/forcontractors/

CONTRACTOR'S QUALIFICATION STATEMENT - AIA Document A305 (2020)

An owner preparing to request bids or to award a contract for a construction project often requires a means of verifying the background, references, and financial stability of any contactor being considered. These factors, along with the time frame for construction, are important for an owner to investigate. Using AIA Document A305-2020, the contractor may provide a sworn, notarized statement and appropriate attachments to elaborate on important aspects of the contractor's qualifications.

BID BOND - AIA Document A310 (2010)

AIA Document A310-2010, a simple, one-page form, establishes the maximum penal amount that may be due to the owner if the selected bidder fails to execute the contract or fails to provide any required performance and payment bonds.

PERFORMANCE BOND AND PAYMENT BOND - AIA Document A311 (1970)

AIA Document A311 incorporates two bonds – one covering the contractor's performance, and the other covering the contractor's obligations to pay subcontractors and others for material and labor. In addition, AIA A311 obligates the surety to act responsively to the owner's requests for discussions aimed at anticipating or preventing a contractor's default.

APPLICATION AND CERTIFICATION FOR PAYMENT, Construction Manager as Adviser Edition - AIA Document G732 (2019)

AIA Document G732-2019 serves as both the contractor's application and the architect's certification. Its use can expedite payment and reduce the possibility of error. If the application is properly completed and acceptable to the architect, the architect's signature certifies to the owner that a payment in the amount indicated is due to the contractor. The form also allows the architect to certify an amount different than the amount applied for, with explanation provided by the architect. The standard AIA Document G703-1992, Continuation Sheet, is appropriate for use with G732-2019.

CONTINUATION SHEET – AIA Document G703 (1992)

AIA Document G703-1992, Continuation Sheet, and G702-1992 (or G732-2019 if there is a Construction Manager), provide convenient and complete forms on which the contractor can apply for payment and the architect can certify that payment is due. The forms require the contractor to show the status of the contract sum to date, including the total dollar amount of the work completed and stored to date, the amount of retainage (if any), the total of previous payments, a summary of change orders, and the amount of current payment requested. AIA Document G703-1992 breaks the contract sum into portions of the work in accordance with the schedule of values prepared by the contractor as require by the general conditions. Note: The AIA does not publish a standard schedule of values form.

CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS – AIA Document G706 (1994)

The contractor submits this affidavit with the final request for payment, stating that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the owner might be responsible has been paid or otherwise satisfied. AIA Document G706-1994 requires the contractor to list any indebtedness or known claims in connection with the construction contract that have not been paid or otherwise satisfied. The contractor may also be required to furnish a lien bond or indemnity bond to protect the owner with respect to each exception.

CONTRACTOR'S AFFIDAVIT OR RELEASE OF LIENS – AIA Document G706A (1994)

AIA Document G706A-1994 supports AIA Document G706-1994 in the event that the owner requires a sworn statement of the contractor stating that all releases or waivers of liens have been received. In such event, it is normal for the contractor to submit AIA Documents G706-1994 and G706A-1994 along with attached releases or waivers of liens for the contractor, all subcontractors, and others who may have lien rights against the owner's property. The contractor is required to list any exceptions to the sworn statement provided in G706A-1994 and may be required to furnish to the owner a lien bond or indemnity bond to protect the owner with respect to such exceptions.

CONSENT OF SURETY TO FINAL PAYMENT – AIA Document G707 (1994)

AIA Document G707-1994 is intended for use as a companion to AIA G706-1994, Contractor's Affidavit of Payment of Debts and Claims, on construction projects where the contractor is required to furnish a bond. By obtaining the surety's approval of final payment to the contractor and its agreement that final payment will not relieve the surety of any of its obligations, the owner may preserve its rights under the bond.

CONSENT OF SURETY TO FINAL REDUCTION IN OR PARTIAL RELEASE OF RETAINAGE – AIA Document G707A (1994)

This is a standard form for use when a surety company is involved and the owner/contractor agreement contains a clause whereby retainage is reduced during the course of the construction project. When duly executed, AIA Document G707A-1994 assures the owner that such reduction or partial release of retainage does not relieve the surety of its obligations.

SUPPLEMENTAL ATTACHMENT FOR ACORD CERTIFICATE OF INSURANCE 25 – AIA Document G715 (2017)

For use in adopting ACORD Form 25 to certify contractor insurance coverages required under standard form of agreement between Owner and Contractor. Because the ACORD certificate does not have space to show all coverages required in standard form of agreement between Owner and Contractor, the Supplemental Attachment form should be completed, signed by the contractor's insurance representative, and attached to the ACORD certificate.

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A311

Performance Bond

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, in the amount of

Dollars ($),

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Contractor has by written agreement dated 19 , entered into a contract with Owner for
(Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

PERFORMANCE BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this day of 19

(Witness) (Principal) (Seal)

(Title)

(Witness) (Surety) (Seal)

(Title)

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A311

Labor and Material Payment Bond

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Principal, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of

(Here insert a sum equal to at least one-half of the contract price) Dollars ($),

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated 19 , entered into a contract with Owner for

(Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

LABOR AND MATERIAL PAYMENT BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this day of 19

	(Principal) (Seal)
(Witness)	
	(Title)
	(Surety) (Seal)
(Witness)	
	(Title)

INFORMATION AVAILABLE TO BIDDERS

LIMITED GEOTECHNICAL INVESTIGATION
NORTH SYRACUSE CENTRAL SCHOOL DISTRICT – GILLETTE ROAD MIDDLE SCHOOL
(Number of Pages - 34)
Prepared by:
Whitestone
May 30, 2024

The materials and conditions indicated in these reports are offered as supplementary only. The reports are not inserted as part of the Contract Documents for this project, nor shall they be considered as instructions or specifications for execution of Work.

There is no guarantee, either expressed or implied, that the conditions indicated are representative of those actually existing throughout the area or in any part of it, or that unforeseen developments may not occur. Interpretation or extrapolation of the reports presented is the responsibility of the Contractor.

WHITESTONE

500 CANAL VIEW BOULEVARD
SUITE 700
ROCHESTER, NY 14623
585.252.6879
whitestoneassoc.com

May 30, 2024

via email

NORTH SYRACUSE CENTRAL SCHOOL DISTRICT
c/o APPEL OSBORNE LANDSCAPE ARCHITECTURE
102 West Division Street
Suite 100
Syracuse, New York 13204

Attention: Stacey Albunio, RLA
Project Manager

Regarding: LIMITED GEOTECHNICAL INVESTIGATION
PROPOSED GILLETTE ROAD MIDDLE SCHOOL IMPROVEMENTS
6150 SOUTH BAY ROAD
SECTION 53, BLOCK 2, LOT 6.1
CICERO, ONONDAGA COUNTY, NEW YORK
WHITESTONE PROJECT NO.: GR2421693.Y00

Dear Ms. Albunio:

Whitestone Associates Engineering & Geology NY, PLLC (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The results of the investigation and recommendations presented below are based on the soil conditions disclosed from a limited number of explorations conducted during Whitestone's field investigation. The purpose of the investigation was to assess subsurface conditions within the proposed improvement areas accessible to track-mounted drilling equipment. Recommendations for support of the proposed structures and pavements, and anticipated earthwork requirements are included herein.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The 37-acre property, located at 6150 South Bay Road in Cicero, Onondaga County, New York, is identified further as Section 53, Block 2, Lot 6.1. The property is developed with the Gillette Road Middle School, which has extensive playing fields.

1.2 Site Geology

According to the University of the State of New York, The State Education Department *Surficial Geologic Map of New York, Finger Lakes Sheet* (1986), the site is underlain by glacial till. The mapped boundary with a lacustrine silt and clay deposit is at the northern edge of the site. The lacustrine silt and clay deposit was generally encountered in the borings. The University of the State of New York, The State Education Department *Geologic Map of New York, Finger Lakes Sheet* (1970) indicates that the subject site is underlain by Upper Silurian-age Ilion Shale, consisting of black shale with incidental dolostone, part of the Lockport Group. Bedrock was encountered close to the ground surface in some borings. The site is not within an area mapped as karst.

1.3 Proposed Construction

Based on an undated *Geotech Test Locations Map* provided by Appel Osborne Landscape Architecture of Syracuse, New York, the proposed improvements include development of a new multipurpose synthetic turf field, new field lighting, reconstruction of existing parking areas, and stormwater management area enhancements. Site grades are anticipated to remain relatively unchanged. No new retaining walls are shown on the *Geotech Test Locations Map*.

Detailed structural information was not available at the time of this report. Maximum moment, shear, and axial compression at the base of the poles are anticipated to be less than 1,000 foot-kips, 2.0 kips, and 2.5 kips, respectively.

2.0 FIELD EXPLORATION & TESTING

2.1 Field Exploration

Field exploration at the project site consisted of advancing eight borings (identified as B-1 through B-8) within the proposed improvements area. The borings subsequently were backfilled to the surface with excavated soils from the investigation and patched with "cold patch" asphalt, where appropriate. The locations of the borings are shown on the accompanying *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The asphaltic concrete pavement was cored at 11 locations. The cores indicated that the thickness of the existing asphaltic concrete ranged from approximately one inch to seven inches. The asphaltic concrete core photographs are included in Appendix B. The asphaltic concrete is underlain by approximately six inches to 11 inches (typically six inches to seven inches) of granular subbase, which is generally crushed stone, except for one location where the asphalt was underlain by sandy silt with gravel. The results of the pavement explorations are tabulated below.

SUMMARY OF PAVEMENT SECTION MEASUREMENTS				
Exploration	**Asphaltic Concrete Thickness (in)**	**Asphalt Core Condition**	**Granular Subbase Thickness (in)**	**Granular Subbase Type**
C-1	4.0	Intact	8.0	Crushed stone
C-2	3.3	Intact	7.0	Sandy silt with gravel
C-3	7.0	Intact	7.0	Crushed stone
C-4	2.5	Intact	11.0	Crushed stone
C-5	1.5	Intact	6.0	Crushed stone
C-6	3.5	Intact	6.0	Crushed stone
C-7	1.0	Disintegrated	6.0	Crushed stone
C-8	1.0	Disintegrated	6.5	Crushed stone
C-9	1.0	Intact	6.0	Crushed stone
B-5	1.5	Partially disintegrated	7.0	Crushed stone
B-6	6.3	Intact	8.0	Crushed stone

Dynamic cone penetrometer (DCP) testing was conducted at three locations using a Vertek Smart DCP. The results of the testing are summarized below. Full results are included in Appendix C.

SUMMARY OF DYNAMIC CONE PENETROMETER TESTING		
Location	**Depth Interval Tested (ft)**	**Minimum Inferred CBR (%)**
C-1	0.0 - 1.7	4.0
C-5	0.1 - 1.8	5.8
C-8	0.1 - 0.3	10.0

The subsurface tests were conducted in the presence of a Whitestone engineer, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Infiltration Testing

Soil conditions at the locations of the infiltration testing were evaluated by advancing borings B-1 through B-4, B-7, and B-8. Infiltration tests I-1 through I-5 were then conducted in general accordance with the procedures in the *NYS Stormwater Management Design Manual* at the locations shown on the *Boring Location Plan*. PVC casing, four inches in diameter, was installed to depths of two fbgs to 5.7. The soil in infiltration tests I-1, I-2, and I-3 was pre-soaked for approximately one hour. The soil in infiltration tests I-4 and I-5 was pre-soaked for overnight. Following testing, the casings were removed. The results are tabulated below.

SUMMARY OF INFILTRATION TESTING				
Location	**Approximate Ground Elevation (ft NAVD)**	**Test Depth (fbgs)**	**Approximate Test Elevation (ft NAVD)**	**Infiltration Rate (in/hr)**
I-1 [1]	410	2.0	408.0	0.0
I-2 [1]	410	2.5	407.5	0.0
I-3 [1]	410	3.0	407.0	0.0
I-4 (B-8)	400	4.5	395.5	0.0
I-5 (B-7)	395	5.7	389.3	0.0

Note [1]: Borings B-1 through B-4 advanced in the general area of infiltration tests I-1, I-2, and I-3.

Typically, a Factor of Safety (FoS) is applied to measured infiltration rates to account for siltation and consolidation of soil below the systems over time. Safety factors used should consider how critical the systems are to the development and the available storage. If the system is critical or storage limited, a higher FoS should be applied. Infiltration rates are variable and dependent on test depth and stratification.

2.3 Laboratory Testing

Representative samples of the site soils were subjected to laboratory testing that included moisture content determinations (ASTM D2216), in order to conduct supplementary engineering soil classifications in general accordance with ASTM D2487. The soil strata tested were classified by the Unified Soil Classification System (USCS). Moisture contents are shown on the *Records of Subsurface Exploration.*

3.0 SUBSURFACE CONDITIONS

The subsurface soil conditions encountered within the subsurface tests conducted by Whitestone consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover Materials: Borings B-1 through B-4 encountered six inches to 12 inches of topsoil at the ground surface. Borings B-5 through B-8 encountered one inch to 6.3 inches of asphaltic concrete at the ground surface with six inches to eight inches of granular subbase. At the coring locations, the asphaltic concrete thickness ranged from one inch to seven inches.

Existing Fill: Beneath the surface cover materials, borings B-3 through B-7 encountered existing fill, consisting of reddish-brown to black, loose to dense, sandy silt with gravel to sandy silt. SPT N-values within the existing fill were variable, ranging from six blows per foot (bpf) to 37 bpf. Where penetrated, the existing fill extended to depths of approximately two feet below ground surface (fbgs) to five fbgs. Boring B-6 terminated in the existing fill at a depth of four fbgs.

Lacustrine Deposit: Beneath the existing fill or surface cover materials, borings B-1, B-3, B-4, B-7, and B-8 encountered a lacustrine deposit, consisting of reddish-brown to brown to gray-brown, loose to medium dense, sandy silt to silt (USCS: ML) to medium stiff (occasionally very stiff), silty clay (USCS: CL) to very loose, silty sand (USCS: SM). SPT N-values within the lacustrine deposit were variable, ranging from two bpf to 28 bpf. Borings B-7 and B-8 terminated in this stratum at a depth of nine fbgs.

Glacial Till: Beneath the lacustrine deposit, boring B-3 encountered glacial till, consisting of brown to gray, medium dense to very dense), sandy silt with gravel (USCS: ML). An SPT N-value within the glacial till was 27 bpf. Boring B-3 terminated in the glacial till at a depth of 23.9 fbgs.

Bedrock: Borings B-1, B-2, B-4, and B-5 encountered weathered bedrock at depths of 0.5 fbgs to four fbgs. Borings B-1, B-4, and B-5 terminated in the weathered bedrock at depths of 4.2 fbgs to 10.3 fbgs. Bedrock, cored in boring B-2 from 14.5 fbgs to 19.5 fbgs, consists of reddish-brown to green, weathered, very fine grained, thinly bedded, soft to medium hard, shale. Recovery was only 52 percent. The RQD value was zero percent, indicating “very poor” rock quality. A photograph of the rock core is attached. RQD values typically increase with depth. Weathering generally decreases with depth.

Groundwater: Groundwater was encountered in boring B-3 during the investigation at a depth of 13.5 fbgs at completion of drilling. However, shallower perched water should be expected during construction above impermeable layers, such as at the interface between existing fill and natural site soils, and at the bedrock surface. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

4.0 CONCLUSIONS & RECOMMENDATIONS

Contingent upon construction phase evaluation, Whitestone recommends supporting the light poles on shallow drilled pier foundations extending through any existing fill into the bedrock or lacustrine deposit. Additionally, the site conditions support the use of typical pavement sections using standard New York State Department of Transportation (NYSDOT) specified materials.

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered within the limited exploration conducted. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, Whitestone should be consulted, so that the recommendations of this report can be reviewed.

4.1 Site Preparation & Earthwork

Surface Cover Stripping: Prior to stripping operations, utilities should be identified and secured. Asphaltic concrete, topsoil, organic subsoil, vegetation, and other organic matter should also be removed from within and at least five feet beyond the limits of the proposed improvements, as well as any other area that will require controlled structural fill placement. The contractor should be required to conduct earthwork in accordance with the recommendations in this report, including backfilling any excavation, etc. with structural fill. Fill or backfill should be placed as structural fill in accordance with the recommendations of this report.

Excavation Difficulties: Bedrock was encountered at depths of 0.5 fbgs to four fbgs. However, the bedrock surface typically undulates and may be encountered at shallower depths than in the borings. The upper few feet of fractured/weathered bedrock can likely be broken up with the "hoe-ram" and removed with a large excavator. However, removal of harder bedrock below the upper few feet of weathered and fractured rock will require significant effort.

Surface Preparation/Proofrolling: Prior to placing any fill to raise or restore grades to the desired subgrade elevations, if required, the existing exposed soils should be compacted to a firm and unyielding surface with several passes in two perpendicular directions of a minimum 10-ton vibratory compactor. The surface should then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be conducted after a suitable period of dry weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be attempted in the winter or when temperatures are below freezing, Whitestone should be contracted for alternative surface preparation recommendations. Fill and backfill should be placed and compacted in accordance with Section 4.2.

Weather Performance Criteria: The site soils are generally moisture sensitive. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 4.2 of this report may be required prior to resuming work on disturbed subgrade soils.

Subgrade Protection and Inspection: Every effort should be made to reduce disturbance of the on-site soils by construction traffic and surface runoff. The on-site materials may deteriorate when subjected to repeated construction traffic and/or inclement weather, which would require removal and replacement. The contractor should be responsible for protection of subgrades and minimization of exposure of the site

materials to precipitation by covering stockpiles and subgrades with plastic and preventing ponding of water by sealing subgrades before precipitation events and grading the site to allow proper drainage of surface water. All rutting from construction equipment should be removed prior to any forecasted or actual precipitation. Whitestone should be retained to observe soil conditions during construction and review the suitability of prepared foundation subgrades for support of design loads.

Groundwater Control: Groundwater was encountered in one boring at a depth of 13.5 fbgs. However, shallow perched water may be encountered during construction above relatively impermeable layers, such as at the interface between existing fill and natural site soils, and at the bedrock surface. As such, construction phase dewatering may consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that construction phase dewatering could include installing temporary sump pits and filtered pumps within trenches and excavations. Whitestone recommends that foundation construction occur during periods of relatively dry weather. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of foundation areas to precipitation.

4.2 Structural Fill & Backfill

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well-graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Synthetic Turf Support: The manufacturer of the synthetic turf selected for installation will have specific requirements for subgrade preparation and granular base placement. Whitestone anticipates that a geotextile separation fabric (Mirafi 140N, or similar) will be placed over compacted subgrade and that up to 12 inches of NYSDOT *733-04 Type 2 Subbase*, or similar, will be placed over the geotextile, probably with a thin leveling layer of crusher fines over the granular base, before laying the synthetic turf.

Soil Reuse: The fine-grained lacustrine soils encountered throughout the site are marginally acceptable for reuse as structural fill and/or backfill because of their difficult workability. Reuse of the fine-grained soils will likely require extensive moisture conditioning and/or drying to facilitate their reuse, workability, and compaction in fill areas. Similarly, the existing fill materials generally also have a relatively high fines content and will require drying and/or mixing with more granular material before reuse. In addition, reuse of the existing fill with a higher fines content should not be attempted during inclement weather or in damp conditions. Immediate re-use of some of the existing fill should not be expected. Reuse of the site soils will be contingent on careful review in the field by the owner's geotechnical engineer.

Stringent quality control and inspection by the geotechnical engineer will be required for suitable portions of the on-site soils to be reused as structural fill and backfill, and to check that the soils are properly placed and compacted within two percent of their optimum moisture content.

Immediate re-use of on-site soils for structural fill or backfill should not be anticipated as the majority of the site natural soils are moisture sensitive. On-site natural materials that are or become wet will require extensive handling, such as discing and aerating, which may not be practical during wet seasons or where site area is limited. In order to attempt the re-use of on-site soil, the contractor should cover stockpiled soils, seal subgrades each day with a smooth drum roller, and provide proper surface drainage during forecasted wet weather. Alternatively, imported fill materials may be required to expedite earthwork operations. The stripped surface cover materials should not be used as structural fill or backfill.

Submerged Fill: In the wet (flooding, perched water, or groundwater), consideration should be given to placing an open-graded, 0.75-inch crushed stone to provide a working mat, expedite dewatering efforts and enable subsequent placement of structural fill or backfill in the dry. Prior to placing submerged fill materials, free water and disturbed materials should be removed to the extent recommended by the geotechnical engineer. A fines barrier geotextile, such as *Mirafi 140N* or equivalent, should be placed at the base and sides of the overexcavation to separate the crushed stone from underlying and adjacent soils. The fabric also should be placed on top of the crushed stone prior to subsequent fill placement, if fill soils with a substantial amount of fines are to be used to restore grade.

Compaction and Placement Requirements: Fill and backfill should be placed in loose lifts no more than 12 inches thick when compacted with a vibratory roller compactor weighing at least one ton, and eight inches when compacted with a plate compactor. Fill and backfill should be compacted to 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

4.3 Foundation Design Criteria

Light Pole Foundations: Light poles may be supported on shallow drilled pier foundations, typically a concrete filled "Sonotube" in an augered hole or a precast concrete cylindrical base placed in the augered hole. Subsurface conditions vary significantly across the site, such that the piers could be wholly within bedrock or the lacustrine deposit, materials with substantially different load carrying capacities. The design parameters presented below are for the lacustrine deposit and represent the lower bound case. The light pole manufacturer will provide the design based on the actual loading.

Whitestone recommends that the piers have a minimum diameter of 24 inches, and a minimum embedment of seven feet below adjacent finished grade. (Piers wholly in bedrock should have a minimum embedment of five feet below adjacent finished grade.) The piers may be designed on the basis of a maximum allowable bearing pressure of 4,000 psf. Shaft (skin) friction should be ignored above a depth of 3.5 fbgs. Below a depth of 3.5 fbgs, maximum allowable shaft friction of 100 pounds per square foot (psf) and 75 psf may be used for compression and tension loading, respectively. An allowable lateral bearing pressure for the lacustrine deposit of 100 pounds per square foot per foot (psf/ft) below grade may be used for support of lateral loads, however, the upper 12 inches of the pier should be ignored in the calculation of lateral resistance. Whitestone should review the design of the piers.

Groundwater was encountered in the one boring at a depth that is likely below the bottom of the drilled piers. However, shallower perched water may infiltrate into the piers. Pumping or bailing may be required to establish a dry hole for concrete placement.

Once the design embedment is reached, loose soil should be removed. The typically narrow annular space between the "Sonotube" or cylindrical base, and the sides of the augered hole should be filled with flowable fill, especially where lateral resistance is being relied upon.

Pier construction should be monitored to confirm that the pier is excavated to the appropriate depth, the hole is dry, and any debris and/or loose soil/rock are removed from the bottom of the excavation. For poured concrete piers, the reinforcement should be aligned correctly with adequate cover, and concrete should be directed down the center of the pier without segregating from striking the reinforcing steel.

Seismic Site Class: Based on a review of the subsurface conditions relevant to the *New York State Building Code*, the subject site has been assigned a Site Class D. The site soils are not susceptible to earthquake induced liquefaction.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils at the pier bottoms be reviewed by a geotechnical engineer immediately prior to placing concrete. In the event that areas of unsuitable materials are encountered, additional excavation and longer piers may be necessary.

Frost Coverage: Foundations subject to frost action should be placed at least 48 inches below adjacent exterior grades, or the depth required by local building codes, to provide protection from frost penetration.

Settlement: Whitestone estimates post construction settlements of proposed foundations of less than one inch, if the recommendations outlined in this report are properly implemented.

4.5 Pavement Design Criteria

Whitestone anticipates that the properly inspected and approved existing fill (improved with thorough surface compaction) or lacustrine deposit, and/or compacted structural fill/ backfill placed to raise or restore design elevations will be suitable for support of the proposed new pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with the recommendations of this report during favorable weather conditions.

A California Bearing Ratio value of 5.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 30,000 ESALs and 75,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

Pavement components should meet material specifications from NYSDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	**Material**	**Standard-Duty Thickness (inches)**	**Heavy-Duty Thickness (inches)**
Asphalt Top Course	NYSDOT 12.5 mm F3 Top Course HMA, 70 Series Compaction (Superpave); PG64S-22	1.5	1.5
Asphalt Binder Course	NYSDOT 19 mm F9 Binder Course HMA, 70 Series Compaction (Superpave); PG64S-22	2.5	3.5
Granular Subbase	NYSDOT 733-04 Type 2 Subbase	12.0	12.0

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at ingress/egress locations. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (inches)**
Surface	4,000 psi air-entrained concrete	6.0 [1]
Granular Subbase	NYSDOT 733-04 Type 2 Subbase	12.0

Note [1]: The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of six-inch by six-inch W5.4/W5.4 welded wire fabric (ASTM A185).

The site soils and shallow weathered bedrock have poor drainage characteristics. Whitestone recommends installing interceptor drains extending from catch basin structures to improve drainage within these areas. Interceptor drains typically consist of top perforated polyvinyl chloride (PVC) piping within a 12-inch by 12-inch, clean 0.75-inch crushed stone layer surrounded by a fines separation fabric. A woven fabric, such as long term clog resistant *Mirafi FW700*, or approved equivalent, is recommended. Interceptor drains should be designed to pitch towards and discharge into the stormwater drainage system. The pipes should have a minimum slope of 0.5 percent.

The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with the recommendations of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control, a network of interceptor drains and an edge drain where the pavement abuts higher ground.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that NYSDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

Following paving, as with all asphaltic concrete pavement, a maintenance program should be implemented for the design life of the new pavement. The program should include, when appropriate, sealing cracks with hot rubberized sealant and applying a polymer-modified asphalt emulsion seal coat over the entire pavement. Maintenance should be conducted bi-annually, prior to freezing weather conditions and following periods of increased freeze-thaw cycles, typically in the spring. Detailed records of the sealing and repairs that are conducted should be kept. The geotechnical engineer should be an active participant in the program. Pavement cracks greater than ¼ inch in width should be cleaned of weeds, etc. and air-jetted to remove trapped materials. The resultant void should be filled with hot rubberized sealant.

4.6 Retaining Walls/Lateral Earth Pressures

The following parameters may be used for design of any retaining walls, below-grade walls, and other structures reliant on granular materials to provide adequate drainage. However, the parameters are not directly applicable to the design of mechanically stabilized earth (MSE) retaining walls, which require proprietary design methods for the selected earth retention system.

Retaining/below-grade walls should be capable of withstanding active and at-rest earth pressures. Backfill soils adjacent to these structures should consist of freely draining granular fill composed primarily of coarse to fine sand. With an active earth pressure coefficient (K_a) of 0.33, level backfill, and an assumed maximum backfill soil unit weight of 140 pounds per cubic foot (pcf), an equivalent fluid pressure of 46 psf per foot of wall height should be used in design of retaining/below-grade walls which are free to rotate.

Retaining/below-grade walls and wall corners typically are restrained from lateral movement and should be designed using at-rest earth pressures. A coefficient of at-rest earth pressure (K_o) of 0.5, for a level backfill, is recommended for retaining/below-grade walls designed to resist at-rest earth pressures, which assume no lateral movement. With an assumed maximum total unit weight of backfill of approximately 140 pcf, an equivalent fluid pressure of 70 pounds per square foot per foot of wall height should be used in design of restrained retaining/below-grade wall and wall corners. A coefficient of friction of 0.4 against sliding can be used for concrete on the existing site soils. Additional lateral earth pressures from a sloped backfill or any temporary or long-term surcharge loads also should be included in the design. Retaining wall design should include a global stability analysis.

Whitestone recommends that granular soils be used to backfill behind retaining walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 U.S. Standard sieve. Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

Positive drainage should be provided at the base of the below-grade walls. Where wall drainage is not provided or cannot be relied upon, walls are designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

4.7 Excavations

The site soils encountered during the investigation generally are most consistent with, at least, Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) that require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented. Competent bedrock may be excavated at an angle of 1:6 (horizontal:vertical). A steeper temporary excavation angle in the bedrock may be feasible, if the exposed bedrock is reviewed by a professional engineer or geologist.

5.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that any encountered underground structures are properly backfilled, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to synthetic turf and pavement support should be witnessed and documented by the owner's geotechnical engineer, who should also monitor drilled pier construction.

6.0 CLOSING

Whitestone's geotechnical division appreciates the opportunity to be of service to Appel Osborne Landscape Architecture and North Syracuse Central School District. Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein. Please contact us at (585) 252-6879 with any questions regarding this report.

Sincerely,

WHITESTONE

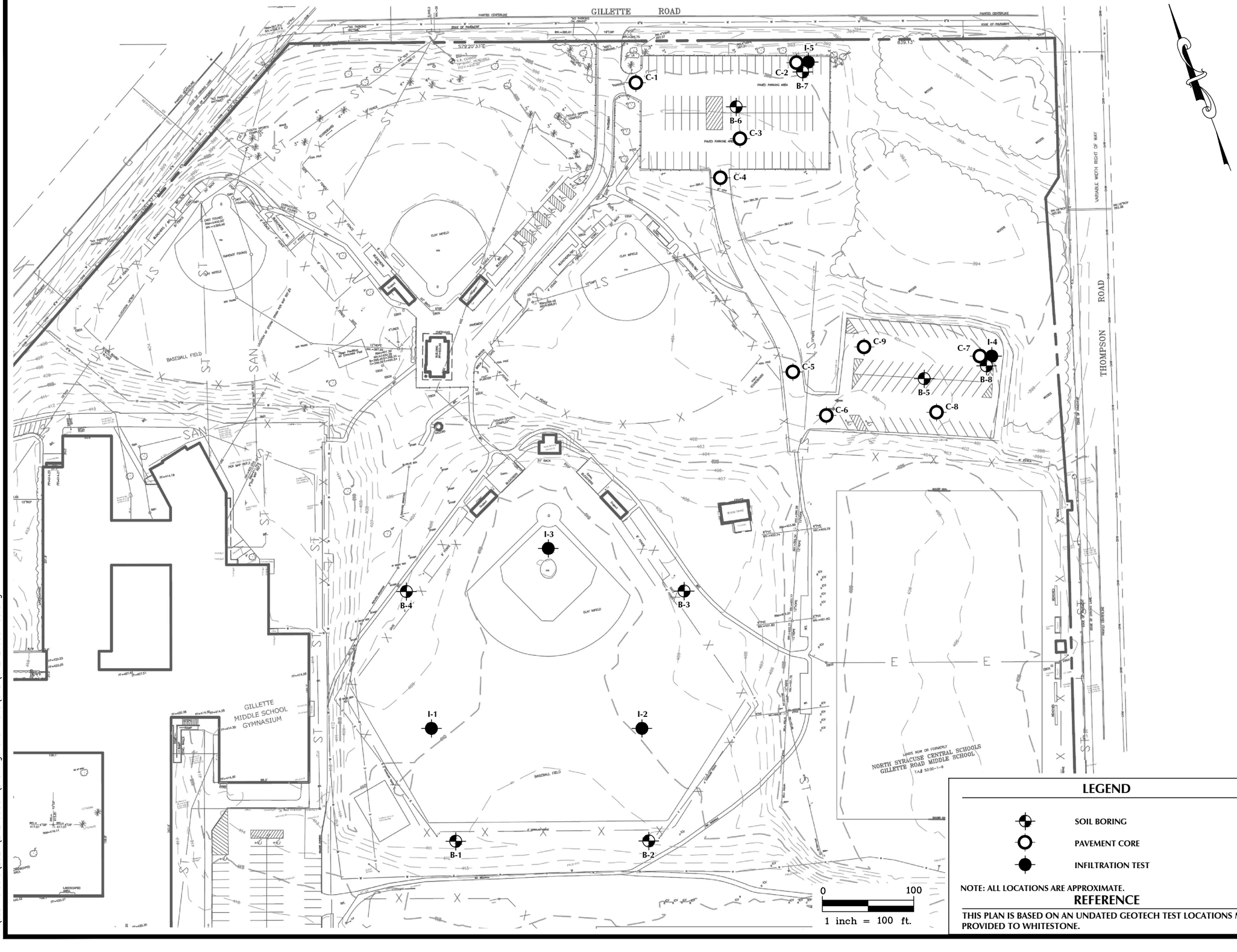
Charles B. Guzzetta, P.G.
Regional Manager, Upstate New York

Ryan R. Roy, P.E.
Vice President

RWM/th P:\Data\Job Folders\2024\2421693GR\Reports and Submittals\Appel Gillette MS Cicero NY GR2421693.Y00 LimGI 5-30-24.doc
Enclosures: Asphaltic Concrete Core Photographs
Dynamic Cone Penetrometer Test Results
Bedrock Core Photograph
Copy: Laurence W. Keller, P.E., Whitestone Associates, Inc.

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FIGURE 1
Test Location Plan



LEGEND

- SOIL BORING
- PAVEMENT CORE
- INFILTRATION TEST

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON AN UNDATED GEOTECH TEST LOCATIONS MAP PROVIDED TO WHITESTONE.

WHITESTONE

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585.252.6879 WHITESTONEASSOC.COM

DRAWING TITLE:
TEST LOCATION PLAN

CLIENT:
NORTH SYRACUSE CENTRAL SCHOOL DISTRICT
c/o APPEL OSBORNE LANDSCAPE ARCHITECTURE

PROJECT:
PROPOSED GILLETTE ROAD MIDDLE SCHOOL PROJECT
6150 SOUTH BAY ROAD
CICERO, ONONDAGA COUNTY, NEW YORK

PROJECT #: GR2421693.Y00	
DESIGNED BY: MR	PROJ. MGR.: CG
DATE: 5/21/24	FIGURE: 1
SCALE: 1" = 100'	

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APPENDIX A
Records of Subsurface Exploration

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	10.2 feet bgs	**Date Completed:**	4/14/2024				
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	-- | --	**At Completion:**	-- | --
		Equipment:	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 1.8	S-1	X	1 - 8 - 45 - 50/4"	10	53	1.0	TS		6" Topsoil	
							LACUSTRINE		Reddish-Brown, Medium Dense, Sandy Silt (ML)	
							WR		Weathered Bedrock	
2 - 2.8	S-2	X	46 - 50/4"	6	-				As Above (WR)	
4 - 4.4	S-3	X	50/5"	4	-				As Above (WR)	
						5.0				
6 - 6.4	S-4	X	50/5"	4	-				As Above (WR)	
8 - 8.3	S-5	X	50/3"	1	-				As Above (WR)	
						10.0				
10 - 10.2	S-6	X	50/2"	0	-				No Recovery	
									Boring Log B-1 Terminated at Depth of 10.2 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/12/2024		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	19.5 feet bgs	**Date Completed:**	4/13/2024				
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	-- | --	**At Completion:**	-- | --
	NQ2 Core	**Equipment:**	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		1 - 9 - 15 - 18	20	24		TS		6" Topsoil	
							WR		Weathered Bedrock (WR)	
2 - 3.9	S-2		19 - 38 - 50 - 50/5"	12	88				As Above (WR)	
4 - 5.9	S-3		39 - 45 - 49 - 50/5"	10	94	5.0			As Above (WR)	
6- 6.7	S-4		36 - 50/2"	6	-				As Above (WR)	
8 - 10	S-5		15 - 10 - 27 - 38	12	37				As Above (WR)	
2 - 2.8	S-6		46 - 50/4"	6	-	10.0			As Above (WR)	
			Time (minutes/ft)	Rec.	RQD					
14.5 - 19.5	C-1	NQ2		31" 52%	RQD 0%	15.0			Reddish-Brown to Green, Weathered, Very Fine Grained, Thinly Bedded, Soft to Medium Hard, Shale	
						20.0			Boring Log B-2 Terminated at Depth of 19.5 feet below ground surface.	
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/12/2024		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	23.9 feet bgs	**Date Completed:**	4/12/2024				
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	13.5 | --	**At Completion:**	-- | --
		Equipment:	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		8" Topsoil	
0 - 2	S-1	X	1 - 4 - 6 - 6	16	10		EXISTING FILL		Reddish-Brown to Black, Loose to Medium Dense, Sandy Silt with Gravel (FILL)	
2 - 4	S-2	X	8 - 6 - 5 - 6	12	11				As Above, Medium Dense (FILL)	
4 - 6	S-3	X	3 - 3 - 9 - 11	20	12	5.0			As Above, Loose (FILL)	w/c = 22.5%
							LACUSTRINE DEPOSIT		Brown, Medium Dense, Sandy Silt (ML)	
6 - 8	S-4	X	8 - 12 - 16 - 20	22	28				As Above (ML)	w/c = 18.9%
8 - 10	S-5	X	4 - 4 - 3 - 3	24	7				Brown, Medium Stiff, Silty Clay (CL)	w/c = 25.2%
10 - 12	S-6	X	3 - 3 - 2 - 3	24	5	10.0			As Above (CL)	w/c = 29.5%
						15.0				
15 - 17	S-7	X	2 - 1 - 1 - 1	12	2				Brown, Very Loose, Silty Sand (SM)	w/c = 34.1%
						20.0				
20 - 22	S-8	X	8 - 12 - 15 - 25	12	27		GLACIAL TILL		Reddish-Brown, Medium Dense, Sandy Silt with Gravel (ML)	w/c = 14.7%
23 - 23.9	S-9	X	38 - 50/5"	8	-				As Above, Very Dense (ML)	w/c = 18.2% Cobbles
						25.0			Boring Log B-3 Terminated at Depth of 23.9 feet below ground surface.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/13/2024		
Termination Depth:	10.3 feet bgs	**Date Completed:**	4/13/2024		
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		WOH - 1 - 4 - 5	19	5		TS		12" Topsoil	
							EXISTING FILL		Brown to Black, Loose, Sandy Silt with Gravel (FILL)	
						2.0				
2 - 4	S-2		6 - 8 - 8 - 18	14	16		LACUSTRINE DEPOSIT		Reddish-Brown, Medium Dense, Sandy Silt (ML)	w/c = 21.6%
						4.0				
4 - 6	S-3		17 - 24 - 36 - 49	12	60	5.0	WR		Weathered Bedrock (WR)	
6 - 6.4	S-4		50/5"	4	-				As Above (WR)	
8 - 8.4	S-5		50/5"	3	-				As Above (WR)	
						10.0				
10 - 10.3	S-6		50/3"	2	-				As Above (WR)	
									Boring Log B-4 Terminated at Depth of 10.3 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024	**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)	
Termination Depth:	4.2 feet bgs	**Date Completed:**	4/14/2024				
Proposed Location:	Parking	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	-- | --	**At Completion:**	-- | --
		Equipment:	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		1.5" Asphalt	Cored
							GRAVEL		7" Granular Subbase	
0.2 - 2.2	S-1	X	7 - 16 - 21 - 18	20	37	2.0	EXISTING FILL		Reddish-Brown, Dense, Sandy Silt with Gravel (FILL)	
							WR		Weathered Bedrock (WR)	
2.2 - 4.2	S-2	X	23 - 15 - 17 - 9	16	32				As Above (WR)	
						5.0			Boring Log B-5 Terminated at Depth of 4.2 feet below ground surface.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024		
Termination Depth:	4.0 feet bgs	**Date Completed:**	4/14/2024		
Proposed Location:	Parking	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		6.3" Asphalt	Cored
0.5 - 2	S-1	X	17 - 10 - 12	11	22		GRAVEL		8" Granular Subbase	
							EXISTING FILL		Reddish-Brown, Medium Dense, Sandy Silt with Gravel (FILL)	
2 - 4	S-2	X	8 - 6 - 4 - 4	6	10				As Above, Loose to Medium Dense (FILL)	
						5.0			Boring Log B-6 Terminated at Depth of 4.0 feet below ground surface.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024	**Water Depth | Elevation (feet bgs) | (ft NAVD88)**	**Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)**
Termination Depth:	9.0 feet bgs	**Date Completed:**	4/14/2024		
Proposed Location:	SWM Area / Parking	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		3.3" Asphalt	Cored C-2
							GRAVEL		6" Granular Subbase	
0.5 - 2	S-1	X	16 - 10 - 6	9	16		EXISTING FILL		Reddish-Brown to Black, Medium Dense, Sandy Silt (FILL)	
2 - 4	S-2	X	3 - 3 - 3 - 3	8	6	4.0			As Above, Loose (FILL)	
						5.0	LACUSTRINE DEPOSIT			
5 - 7	S-3	X	5 - 2 - 3 - 3	14	5				Gray-Brown, Medium Stiff, Silty Clay (CL)	Infiltration test @ 5.7 fbgs
7 - 9	S-4	X	5 - 9 - 8 - 7	20	17				As Above, Very Stiff (CL)	
						10.0			Boring Log B-7 Terminated at Depth of 9.0 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-8

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024		
Termination Depth:	9.0 feet bgs	**Date Completed:**	4/14/2024		
Proposed Location:	SWM Area / Parking	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		1" Asphalt (deteriorated); 6" Granular Subbase	Cored C-7
0.5 - 2	S-1	X	9 - 4 - 6	10	10		LACUSTRINE DEPOSIT		Reddish-Brown, Loose to Medium Dense, Silt (ML)	
2 - 4	S-2	X	10 - 6 - 3 - 3	6	9				As Above, Loose (ML)	
						5.0				Infiltration test @ 4.5 fbgs
5 - 7	S-3	X	8 - 6 - 11 - 11	8	17				Brown, Medium Dense, Sandy Silt (ML)	
7 - 9	S-4	X	5 - 5 - 5 - 6	24	10				As Above, Loose to Medium Dense (ML)	
						10.0			Boring Log B-8 Terminated at Depth of 9.0 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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APPENDIX B
Asphaltic Concrete Core Photographs & Bedrock Core Photographs

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ASPHALTIC CONCRETE CORE PHOTOGRAPHS - 1



1. CORE C-1 (4″ Asphalt; 8″ Subbase)



2. CORE C-2 (3.3″ Asphalt; 7″ Subbase)



3. CORE C-3 (7″ Asphalt; 7″ Subbase)



4. CORE C-4 (2.5″ Asphalt; 11″ Subbase)

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ASPHALTIC CONCRETE CORE PHOTOGRAPHS - 2



5. CORE C-5 (1.5″ Asphalt; 6″ Subbase)



6. CORE C-6 (3.5″ Asphalt; 6.5″ Subbase)



7. CORE C-7 (1″ Asphalt; 6″ Subbase)



8. CORE C-8 (1″ Asphalt; 6.5″ Subbase)

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ASPHALTIC CONCRETE CORE PHOTOGRAPHS - 3



9. CORE C-9 (1″ Asphalt; 6″ Subbase)



10. BORING B-5 (2.5″ Asphalt; 7″ Subbase)



11. BORING B-6 (6.3″ Asphalt; 8″ Subbase)

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BEDROCK CORE PHOTOGRAPH



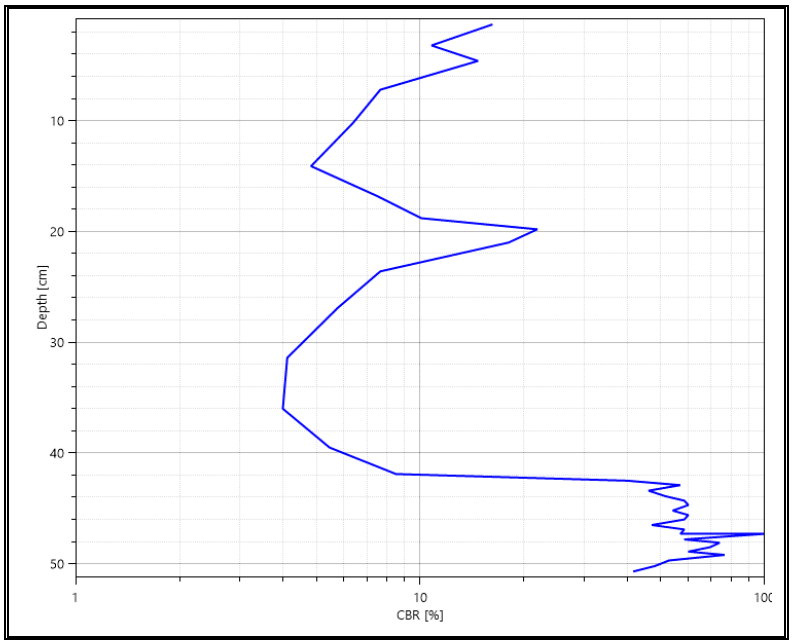
1. BORING B-2: Run 1: 14.5 to 19.5 feet below ground surface

WHITESTONE

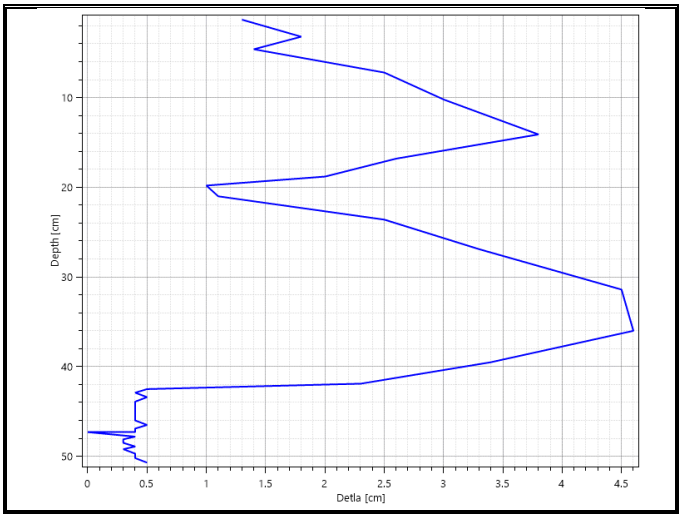
APPENDIX C
Dynamic Cone Penetrometer Test Results

WHITESTONE

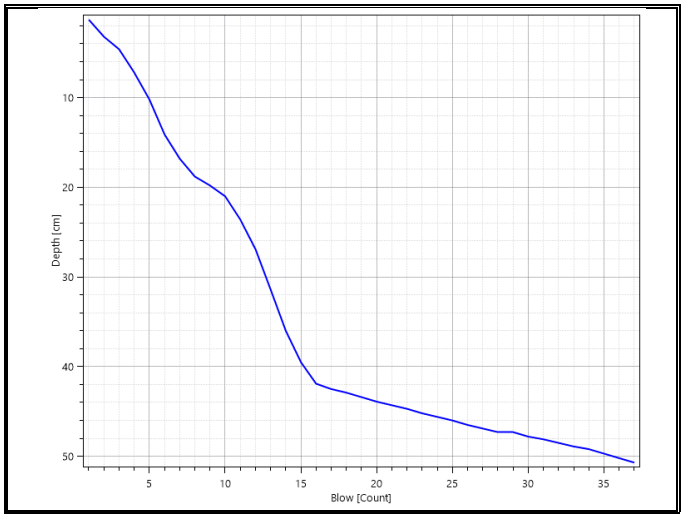
DYNAMIC CONE PENETROMETER TEST RESULTS
Core C-1
North Syracuse Central School District - Gillette Road Middle School
Cicero, Onondaga County, New York



Depth -vs- Inferred California Bearing Ratio



Penetration per blow

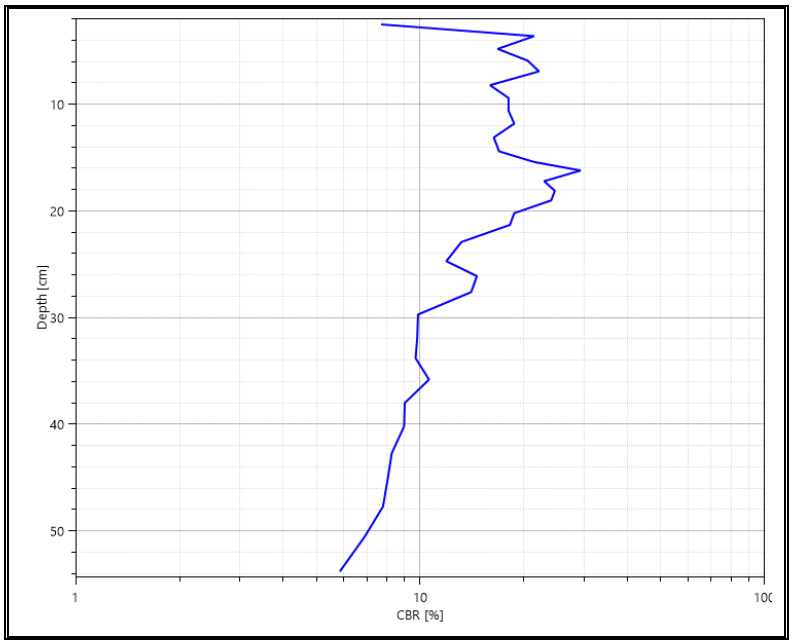


Cumulative blows -vs- Depth

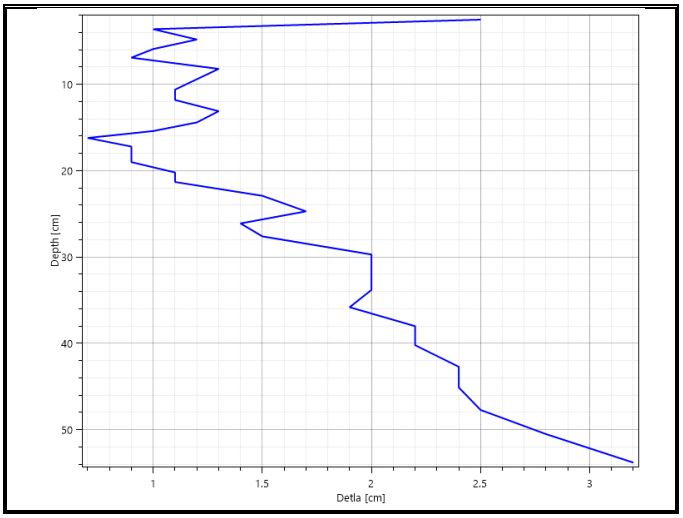
Vertek Smart DCP System (ASTM D6951)

WHITESTONE

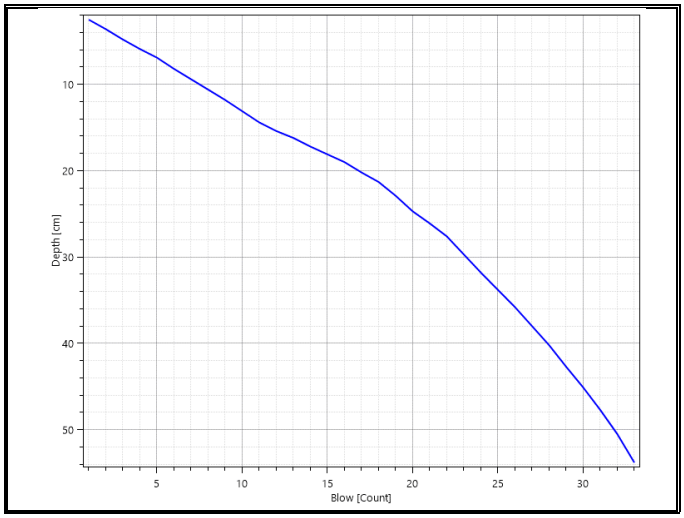
DYNAMIC CONE PENETROMETER TEST RESULTS
Core C-5
North Syracuse Central School District - Gillette Road Middle School
Cicero, Onondaga County, New York



Depth -vs- Inferred California Bearing Ratio



Penetration per blow

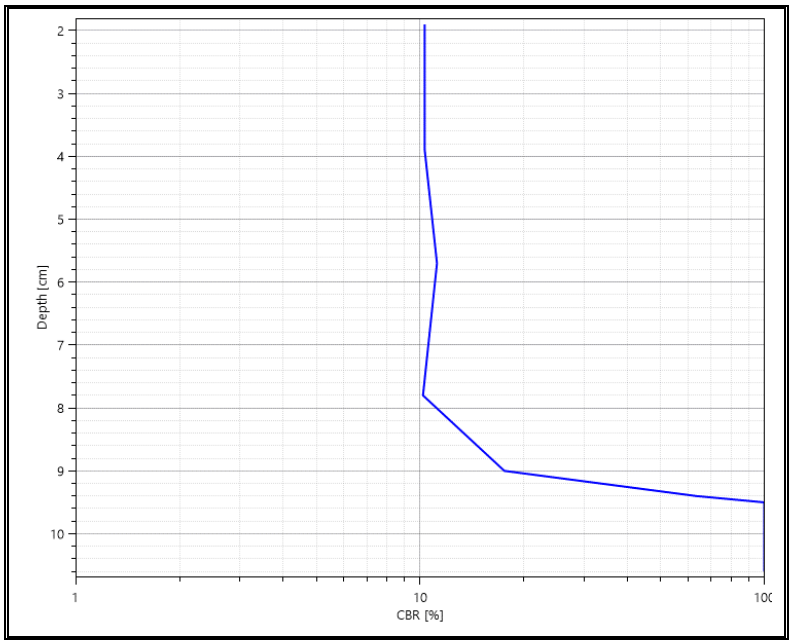


Cumulative blows -vs- Depth

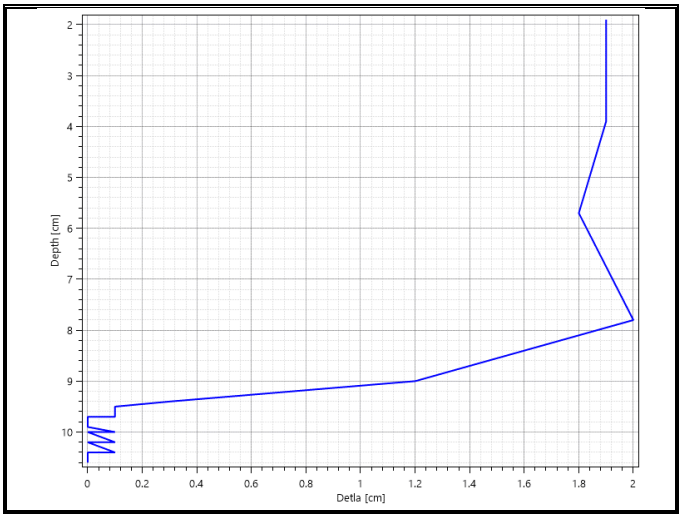
Vertek Smart DCP System (ASTM D6951)

WHITESTONE

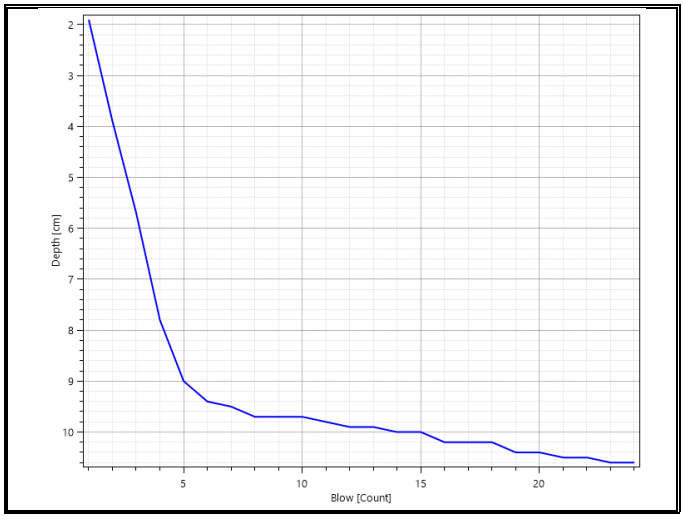
DYNAMIC CONE PENETROMETER TEST RESULTS
Core C-8
North Syracuse Central School District - Gillette Road Middle School
Cicero, Onondaga County, New York



Depth -vs- Inferred California Bearing Ratio



Penetration per blow



Cumulative blows -vs- Depth

Vertek Smart DCP System (ASTM D6951)

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APPENDIX D
Supplemental Information (USCS, Terms & Symbols)

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UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM - Rochester.docx

WHITESTONE

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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

SECTION 010000 – LABOR RATES

PART 1 - GENERAL

1.1 WAGE RATE SCHEDULES

A. The following New York State, Onondaga County schedule of prevailing wage rates and supplements have been provided by the New York State Department of Labor.

B. This prevailing wage rate schedule is listed on the New York State Department of Labor's web site (https://apps.labor.ny.gov/wpp/showFindProject.do?method=showIt) using PRC # 2025010602.

1. It is each Contractor's responsibility to determine and pay the current wage rates and supplements, at the time of payment, throughout the term of the project.

PART 2 - PART 2 – PRODUCTS (Not Applicable)

PART 3 - PART 3 – EXECUTION (Not Applicable)

END OF SECTION 010000

SECTION 011100 - MULTIPLE CONTRACT SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section Includes:

Section 1.3	Design/Management Identification
Section 1.4	Owner-Furnished Products
Section 1.5	Work Covered by Contract Documents
Section 1.6	Work Under Separate Contracts
Section 1.7	Prime Contracts Scope of Work
Section 1.8	Punch Lists, Closeout and Liquidated Damages
Section 1.9	Additional Notes to the Contract Documents
Section 1.10	Access and Use of Site and Premises
Section 1.11	Coordination with Occupants
Section 1.12	Work Restrictions
Section 1.13	Specification and Drawing Conventions
Section 1.14	Miscellaneous Provisions
Section 2.1	Construction Manager
Section 2.2	Coordination

1.3 DESIGN/ MANAGEMENT IDENTIFICATION

A. OWNER

North Syracuse Central School District, Board of Education

5355 West Taft Road

North Syracuse, NY 13212

Owner's Representative:

A. Dr. Terry Ward, Superintendent of Schools

B. Matt Erwin, Director of Facilities

B. ARCHITECT

King and King Architect, LLP

358 West Jefferson Street

Syracuse, NY 13202

Representative: Amanda Thomas, AIA, NCIDQ, Senior Project Manager,

athomas@kingarch.com

C. CONSTRUCTION MANAGER

Watchdog Building Partners

3445 Winton Place, Suite 102

Rochester, New York 14623

Bob Bouffiou, Project Manager, bbouffiou@watchdogbp.com

(585) 760-7855

1.4 OWNER-FURNISHED PRODUCTS

A. The following items are to be supplied by the Owner:
   1. The Owner will provide water testing for potable water fixtures for lead level contamination per SED guidelines. Lead levels exceeding acceptable standards will require the identified fixture(s) to be replaced by the contractor at the contractor's expense.

B. Remedial Contractor
   1. The Owner may choose to engage a Remedial Contractor for any portion of the project for reasons such as, but not limited to, failure to maintain schedule, failure to maintain project cleanliness and correction of rejected work. Contractor responsible for failure will be back charged all cost associated with the Remedial Contractor.
   2. The Remedial Contractor shall perform the following basic duties:
      a. Be familiar with the scope of work of Contracts 101 through 105, including required materials, labor, equipment, subcontractors, supervision, management, and administration necessary to execute any portion of any Contractor’s scop of work if directed.
      b. Provide a complete list of subcontractors and suppliers available to supply materials and perform work at any given time during the project if directed.
      c. Be familiar with the progress of construction from award of contracts through punch list completion. Notify Remedial Contractor subcontract team members of progress and status of construction and ascertain manpower is readily available should it be required. Familiarity of the project progress shall be achieved through the following methods:
         i. Regularly scheduled monthly walk throughs of the project with the Owner, construction Manager and Architect.
         ii. Receipt of regularly scheduled meeting reports documenting the progress and issues of the project.
         iii. Attendance at Project Meetings if Requested by the Owner, Construction Manager or Architect.
         iv. Obtaining Field Observation Reports from the Construction Manager as the project progresses.
   3. Additional duties of Remedial Contract
      a. Upon receipt of written “Notice to Proceed”, Remedial Contractor shall mobilize to the site within 48 hours, to begin performance of “Work” identified as being deficient of specified schedule, quality, or workmanship requirements.
         i. On site duties shall be performed on a “Cost Plus Basis” and will include all costs associated with mobilization/demobilization, labor, materials and specialty tooling.
         ii. Allowable mark up for Remedial Contractor operations shall not exceed twenty-five percent (25%). Labor forces shall be compensated at one hundred fifty percent (150%) of the posted prevailing wage rate for all labor hours worked.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Description

1. The project consists of renovations and site improvements to the North Syracuse Central School District Gillette Road Middle School building, parking lot, multi-purpose field areas, as well as multiple other building upgrades throughout the district.

B. Contract Documents were prepared for the Project by King and King, LLP.

C. The work will be constructed under multiple Prime Contractor Agreements. One set of contract documents is issued covering the multiple Prime Contracts. Prime Contracts are separate contracts between the Owner and independent contractors representing significant construction activities. Each Prime Contract is performed concurrently and closely coordinated with construction activities performed on the Project under other Prime Contracts.

D. Prime Contracts for this Project Include:
General Construction Contract # 101
Mechanical Construction Contract # 102
Plumbing Construction Contract # 103
Electrical Construction Contract # 104
Site Trades Contract # 105

1.6 WORK UNDER SEPARATE CONTRACTS

A. Prime Contractors shall furnish and install all labor, material, supervision, equipment, scaffolding, layout, engineering, deliveries, trucking, hoisting, rigging, shop drawings, submittals, and all other items related and required to complete all work in accordance with the contract documents and all applicable codes having jurisdiction.

B. Prime Contractors submitting a proposal represents they have expertise in the performance of work for his trade and assures all items to be complete, functional, and installed in accordance with the best practices consistent with premium quality material and workmanship.

C. Each Prime Contractor shall have a decision-making representative with knowledge of the project at the bi-weekly project manager coordination meetings. In addition, the Construction Manager will hold weekly foreman coordination meetings and each prime contractor shall have a representative in attendance. On occasion, the Construction Manager may request the presence of a subcontractor at these meetings for coordination purposes. There will be two (2) excused absences allowed. Failure to attend after two (2) excused absences will result in a **four hundred-dollar ($400)** back-charge per meeting.

D. Items not specifically mentioned in the contract documents, but which are inherently necessary to make a complete working installation, shall be included.

E. Local custom and trade-union jurisdictional settlements do not control the scope of the work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruptions and delays.

1.7 PRIME CONTRACTS SCOPE OF WORK

A. General Construction Contract # 101
   1. The General Construction Contractor (GC) shall furnish all material, labor, equipment, subcontractors, supervision, management, and administration required for the total performance of the work of this contract as listed in the following specification sections and shown on the following drawings including, but not limited to:
      a. All work for project as shown on drawings:
         i. Code Compliance Drawings prefixed with the letters (G)
         ii. Hazardous Materials Drawings prefixed with the letters (X)
         iii. Structural Drawings prefixed with the letters (S)
         iv. Architectural Drawings prefixed with the letters (A)
      b. Watchdog Building Partner's Project Manager shall assign MEP sheets, location and drawing notes that specifically pertain to the General Construction Contract.
      c. Provide the complete work for all sections of Divisions 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12.

   2. The GC shall provide cleaning equipment and tools necessary to keep the job site clean during construction operations. Cleaning equipment and tools shall include brooms, flat scoop shovels, dust pans, trash carts, trash receptacles, garbage bags, sweeping compound and equipment to move large amounts of debris from the building to the dumpster. Refer to Temporary Facilities Specification Section for additional cleaning requirements.

   3. Furnish and install all labor, material, supervision, equipment, scaffolding, layout, engineering, deliveries, trucking, hoisting, rigging, shop drawings, submittals, and all other items related and required to complete all General Trades Work in accordance with the contract documents and all applicable codes having jurisdiction.

   4. The contractor represents they have expertise in the performance of work for this trade and assures all items to be complete, functional, and installed in accordance with the best practices consistent with premium quality material and workmanship.

   5. The GC shall provide a laborer for Eight hundred (800) hours to work under the direction of the Construction Manager. The GC shall calculate the 800 hours at a rate of $90/hr. and shall include this cost as part of the base bid. Hours shall be tracked by submission of daily time tickets provided by the GC and signed by the Construction Manager.

   6. The GC shall provide temporary protection for doors, hardware, and finishes (i.e., millwork, counters, flooring, etc.) installed under their contract until the time of final cleaning.

   7. The GC shall be responsible for protecting flooring scheduled to remain in areas of major construction. In addition to protecting floors, the GC shall provide 4-100' rolls of Ram board, or equivalent and 5 rolls of duct tape to the CM to remain in the CM trailer and be made available to all contractors in situations where protecting is needed immediately and the contractor does not have their own Ram board available.

8. The GC is responsible for providing temporary protection on any exterior openings (i.e., window, door, etc.). All openings need to be secured at the end of each workday. With the exception of roof openings being performed by the Mechanical Contractor.

9. Painting of exposed piping, HVAC ductwork and conduit in "Occupiable" spaces shall be by the General Contractor. Painting of exposed piping, HVAC ductwork and conduit in mechanical rooms, boiler rooms, electrical rooms and the building exterior shall be by the installing contractor as noted on the Contract Documents. "Occupiable spaces" means areas where students and staff would normally be permitted. Unless otherwise stated in the documents.

10. The General Contractor is responsible to provide temporary heating from November 1 through May 15, as indicated in Temporary Facilities 3.7 subsection B. The General Contractor is allowed to use School District's fuel, provided the General Contractor maintains the building envelope.

11. The General Contractor shall create the opening, install all loose lintels and louvers for all outdoor air-intake openings. Louvers to be provided by the Mechanical Contractor.

12. The General Contractor shall provide all rough carpentry blocking required for the project unless specifically defined in other prime contractor's scope of work.

13. The General Contractor is responsible for building all emergency exit ways and temporary partition walls. Including but not limited to installation, maintenance, and removal of entire system. The General Contractor is responsible for patching ALL finishes to match existing.

14. General Contractor shall furnish and install all hardware cores, cylinders and labels for the scope of its contract for all new doors and frames that are in the General Contractor contract. General Contractor will install all electric strikes for the scope of its contract and provide transformers for power actuated hardware. The Electrical Contractor shall provide power and connections for transformers and pipe and wire back to nearest available power panel.

15. The General Contractor is responsible to protect all interior equipment and finishes during roof replacement if the roofing is in their scope.

16. The General Contractor will supply 600 LF of 6' high construction fence as directed by the CM.

17. The GC is responsible for the following:
    a. Facilitate pre-submittal conference and keying conference. Verify accuracy of submittals and timely release of material. Verify electrical interfaces with hardware components.
    b. Coordinate hardware and keying requirements with the Owner and in conjunction with existing condition.
    c. Develop a written plan for implementation of hardware. The plan shall include approach, quality assurance plan and a detailed schedule with committed manpower, duration and floor plans that correlate to tasks on the schedule.

d. Verify installations are accurate and done in a qualified manner.
e. Organize extra keys, labeling and O&M information for turnover to the Owner.
f. Assist owner with ordering and roll out of cores for hardware sets.
g. Hardware supplier to assign a project manager to attend a minimum of 4 onsite meetings per building.

18. The GC shall provide an additional 300 LF of temporary fire partitions from floor to deck in existing corridors as directed by the Construction Manager as part of the base bid. Include the following with temporary partition:
    a. Pair of hollow metal 36-inch fire-rated doors with panic egress.
    b. Restore existing finishes at time of removal of temporary partitions.

19. The GC shall provide the necessary preparation work for new finishes to existing walls. Preparation work shall include but is not limited to scraping existing paint/wallpaper, patching, filling, and cleaning.

20. The GC shall be responsible for caulking exterior louvers and associated lintels at building envelope.

21. The GC shall prioritize and expedite submittals for materials with typical long lead times such as hollow metal doors and frames installed in masonry walls.

22. The GC shall be responsible for the layout and coordination of chalkboards, marker boards, tack boards, white boards, smart boards and alike with respect to layout of electrical devices.

23. The GC shall provide necessary custom fitted closure trim around any windows installed in the contract.

24. The GC shall provide exterior wall openings for HVAC equipment unless otherwise noted.

25. The GC shall provide professional cleaning services for final cleaning.

26. The GC shall designate an employee dedicated to secure the building/construction site at the end of each work shift at each location. The designated GC employee shall close and lock all doors, gates and windows.

B. Mechanical Construction Contract # 102
    1. The Mechanical Contractor (MC) shall furnish all material, labor, equipment, subcontractors, supervision, management, and administration required for the total performance of the work of this contract as listed in the following specification sections and shown on the following drawings including, but not limited to:
        a. Code Compliance Drawings prefixed with the letter (G).
        b. HVAC Drawings prefixed with the letter (H).
        c. Provide the complete work for all sections of 00, 01, 02and 23.
        d. Specifications Sections Division 028333 (related to lead), 260010 Basic Electrical Requirements, 260100 Basic Materials and Methods, 260519 Low Voltage Cables (related to control work) as it relates to Mechanical work.

2. Furnish and install all labor, material, supervision, equipment, scaffolding, layout, engineering, deliveries, trucking, hoisting, rigging, shop drawings, submittals, and all other items related and required to complete all Mechanical Trades Work in accordance with the contract documents and all applicable codes having jurisdiction.

3. The Contractor represents they have expertise in the performance of Work for his trade and assures all items to be complete, functional and installed in accordance with the best practices consistent with premium quality material and workmanship.

4. The MC shall provide a laborer for five hundred (500) hours to work under the direction of the Construction Manager. The MC shall calculate the 500 hours at a rate of $90/hr. and shall include this cost as part of the base bid. Hours shall be tracked by submission of weekly time tickets provided by the MC and signed by the Construction Manager.

5. The MC shall provide access panels where necessary as a means to access plumbing valves/equipment. Access panels/doors shall match wall and ceiling fire ratings.

6. Coordinate all HVAC electrical work with the Electrical Contractor and Construction Manager.

7. The MC shall provide housekeeping pads for equipment provided. At minimum, pads shall be constructed of 4000 psi concrete, be 4” thick and sized large enough for equipment to be placed on pad with 6” concrete reveal at all sides.

8. The MC shall include any necessary isolation valves (material and labor) for new and existing piping to facilitate the phasing schedule of work.

9. For General Clarification: Louvers are to be provided by the MC and turned over to the GC for their installation by General Trades. All sheet metal sleeves, etc. for connection of mechanical unit to louver shall be furnished by the MC.

10. The MC will cut roof decking for penetrations and structural infill of openings as per drawings. The MC shall install all curbs and venting. The MC responsible for all blocking and flashing as related to curbing and other roof structures. The MC is to make sure all openings are properly protected and weather tight at the end of each workday.

11. The MC shall provide mechanical equipment submittals within four (4) weeks after award of contract.

12. Balancing of systems is to coincide with the phasing plan and occupancy requirements. Contractor shall schedule individual unit balancing as directed by Construction Manager. There will be no additional compensation for multiple trips required due to phasing or occupancy requirements.

13. The MC shall provide as many pressure tests on work as needed to maintain the Construction Schedule.

C. Plumbing Construction Contract # 103

1. The Plumbing Contractor (PC) shall furnish all material, labor, equipment, subcontractors, supervision, management, and administration required for the total performance of the work of this contract as listed in the following specification sections and shown on the following drawings including, but not limited to:
   a. Code Compliance Drawings prefixed with the letter (G).
   b. Plumbing Drawings prefixed with the letter (P).
   c. Provide the complete work for all sections of Divisions 00, 01, 02,and 22.
   d. Specifications Sections Division 028333 (related to lead), 260010 Basic Electrical Requirements, 260100 Basic Materials and methods as it relates to Plumbing.

2. Furnish and install all labor, material, supervision, equipment, scaffolding, layout, engineering, deliveries, trucking, hoisting, rigging, shop drawings, submittals, and all other items related and required to complete all Plumbing Trades Work in accordance with the Contract Documents and all applicable codes having jurisdiction.

3. The Plumbing Contractor shall note the plumbing equipment is intended to be provided in accordance with the completion dates indicated on the phasing schedule.

4. The Contractor represents they have expertise in the performance of Work for this trade and assures all items to be complete, functional and installed in accordance with the best practices consistent with premium quality material and workmanship.

5. The PC shall provide a laborer for one hundred (100) hours to work under the direction of the Construction Manager. The PC shall calculate the 100 hours at a rate of $90/hr. and shall include this cost as part of the base bid. Hours shall be tracked by submission of weekly time tickets provided by the PC and signed by the Construction Manager.

6. The PC shall be responsible for offsite disposal of unsuitable spoil resulting from their excavation work.

7. The PC is responsible for saw cutting, trenching, and concrete placement as related to the work, including excavation, bedding, backfill, and compaction with appropriate specified materials to subgrade elevation. The PC shall provide vapor barrier, wire mesh and dowels at concrete patching.

8. The PC shall provide access panels in accessible areas as a means to access plumbing valves/equipment. Access panels/doors shall match wall and ceiling fire ratings.

9. The PC shall provide temporary protection for work of plumbing contract until time of final cleaning by the GC.

10. The PC shall provide housekeeping pads for equipment provided. At minimum pads shall be constructed of 4000 psi concrete, be 4” thick and sized large enough for equipment to be placed on pad with 6” concrete reveal at all sides.

11. The PC shall include necessary isolation valves (material and labor) for new and existing piping to facilitate the phasing schedule of work.

12. The PC shall provide as many pressure tests on his work as needed to maintain the Construction Schedule.

13. The PC shall scope existing sanitary lines to which they are tying into and provide a video and report to Watchdog Building Partners (WBP), prior to construction activities. The PC shall notify WBP of the date(s) and time(s) they will be performing the scope. The report provided to WBP shall minimally identify:

    a. Date(s) of scope
    b. Time(s) of scope
    c. Who performed the scope
    d. Detailed information outlining the condition of the lines
    e. Location of lines on a marked-up drawing

14. The PC shall connect loose accessories such as gas hoses, etc., for Food Service equipment pertaining to plumbing contract.

D. Electrical Construction Contract # 104

1. The Electrical Contractor (EC) shall furnish all material, labor, equipment, subcontractors, supervision, management, and administration required for the total performance of the work of this contract as listed in the following specification sections and shown on the following drawings including, but not limited to:
    a. Code Compliance Drawings prefixed with the letter (G).
    b. Electrical Drawings prefixed with the letter (E).
    c. Provide the complete work for all sections of Divisions 00, 01, 02, 26, 27, 28, .
    d. Specifications Sections Division 028333 (related to lead), 260010 Basic Electrical Requirements, 101426 If relating to electric.
    e. Division 32 as pertaining to sitework electric.

2. Furnish and install all labor, material, supervision, equipment, scaffolding, layout, engineering, deliveries, trucking, hoisting, rigging, shop drawings, submittals, and all other items related and required to complete all Electrical Trades Work in accordance with the Contract Documents and all applicable codes having jurisdiction.

3. The Contractor represents they have expertise in the performance of Work for this trade and assures all items to be complete, functional and installed in accordance with the best practices consistent with premium quality material and workmanship.

4. All temporary lighting is the responsibility of the electrical contractor.. These responsibilities include providing, installing, maintaining, and removing lighting.

5. The EC is responsible to hookup all loose electrical accessories for Food Service equipment. All loose electrical cords and accessories will be provided by the Food Service contractor.

6. The EC shall provide a laborer for eight hundred (800) hours to work under the direction of the Construction Manager. The EC shall calculate the 800 hours at a rate of $90/hr. and shall include this cost as part of the base bid. Hours shall be tracked by submission of weekly time tickets provided by the EC and signed by the Construction Manager.

7. The EC shall be responsible for offsite disposal of unsuitable spoils resulting from their excavation work.

8. The EC shall be responsible for saw cutting, trenching, and concrete placement as related to the work, including excavation, bedding, backfill, and compaction with appropriate specified materials to subgrade elevation. The EC shall provide vapor barrier, wire mesh and dowels at concrete patching.

9. The EC is responsible for ALL electrical hookups and final connections needed for all new and relocated equipment.

10. The EC shall note the intent of the Electrical Contract is to be provided in accordance with the completion dates included on the phasing schedules.

11. The EC shall provide access panels in accessible areas as a means to access junction boxes. Access panels/doors shall match wall and ceiling fire ratings.

12. The EC shall provide housekeeping pads for equipment provided. At minimum, pads shall be constructed of 4000 psi concrete, be 4” thick and sized large enough for equipment to be placed on pad with 6” concrete reveal at all sides.

13. The EC shall be responsible for coordination of all electrical systems changeovers. Submit plan for Owner approval. All shutdowns and changeovers shall occur off hours. Coordinate all electrical work installations with the Construction Manager. The EC shall remove all temporary electrical systems at the end of construction.

14. The EC is solely responsible for bringing all power to all security devices.

15. The EC shall permanently secure (as high as possible) existing loose wiring, cabling and conduit including but not limited to communication cabling, fiber optic, data cabling, control wiring, etc., in areas where complete ceiling removal and replacement is scheduled.

16. The EC shall reinstall existing devices that were temporarily suspended by others as part of the abatement work. Devices include but are not limited to lights, speakers, exit signs, fire alarm devices, security devices, etc., and orientate the fixtures to duplicate their original installation placement.

17. The EC shall provide adequate support and protection for the electrical systems until such time as the new systems are in place and ready for use by the Owner. The EC shall maintain existing systems including Owner requirements for power, lighting, safety and communication systems throughout the construction project.

18. The EC shall supply control and power wiring, electrical door hardware, and security devices. Power connections shall be made to the nearest circuit available or as indicated in the project documents.

E. Site Trades Contract # 105
   1. The Site Trades Contractor (SC) shall furnish all material, labor, equipment, subcontractors, supervision, management, and administration required for the total performance of the work of this contract as listed in the following specification sections and shown on the following drawings including, but not limited to:
      a. Code Compliance Drawings prefixed with the letter (G).
      b. Site/Civil Drawings prefixed with the letter (L).
      c. Provide the complete work for all sections of Divisions 00, 01, 02, 31, 32, and 33.

   2. Notes to Site Contractor:
      a. The SC is responsible for offsite disposal of unsuitable soil and rock resulting from their work.
      b. The SC is responsible for their own dumpsters.
      c. The SC is responsible for laying out exterior light pole bases.

   3. The Contractor represents they have expertise in the performance of Work for this trade and assures all items to be complete, functional and installed in accordance with the best practices consistent with premium quality material and workmanship.

1.8 PUNCH LISTS, CLOSEOUT AND LIQUIDATED DAMAGES

A. Liquidated damages for failure to complete completion lists, punch lists and closeout obligations shall be assessed as outlined. Requirements of this section are complementary and not intended to supersede closeout requirements and procedures specified in any closeout section of these specifications.

B. Assessment of the completion of the work and timing of the issuance of completion list(s), punch list(s) or a combination of both will be through joint effort of the Construction Manager and Architect.

C. For the purposes of this section, “Completion List” shall mean a compiled list of work remaining to be installed or completed by the Contractor or its subcontractor to achieve substantial completion. “Punch list” shall mean a list of items requiring attention to correct deficiencies to installed work. The Construction Manager and/or Architect will issue such list as the work progresses. The Contractor shall give prompt attention to completing or correcting such items illustrated on the list.

D. In In the event a Contractor fails, refuses or neglects to perform “completion list” or “punch list” obligations thirty (30) days following the date of issuance, Contractor will be charged twenty-five dollars per day for each incomplete item until substantially complete. Forty-five (45) days after issuance of such list(s), in addition to the twenty-five dollars per day per item penalty, Contractor

shall be liable to the Owner for any additional costs associated with Owners forces completing any item on the list.

E. After substantial completion, the Construction Manager shall issue a closeout matrix to the Contractor listing all required closeout documentation and turn over items. Contractor shall have 30 days from date of issuance of the closeout matrix to submit all items. In the event Contractor fails to submit items within 30 days, the Owner may choose one of the following options:

   a. Owner will direct the Architect and Construction Manager to acquire all closeout items and documentation listed on the closeout matrix. The Contractor shall be liable to the Owner for all costs associated with this failure, refusal, or neglect, including Attorney, Architect and Construction Manager fees at their current hourly rates. The Contractor shall also be liable to the Owner for all turnover materials and special tooling cost due to completing the closeout matrix requirements.

   b. Owner may impose a liquidated damage of fifty dollars ($50/day) per day until submitted. After sixty (60) days, in addition to the $50/day Owner will direct the Architect and Construction Manager to acquire all closeout items and documentation listed on the closeout matrix. The Contractor shall be liable to the Owner for all costs associated with this failure, refusal, or neglect, including Attorney, Architect and Construction Manager fees at their current hourly rates. The Contractor shall also be liable to the Owner for all turnover materials and special tooling cost due to completing the closeout matrix requirements.

   c. Items requiring resubmission due to architectural/engineering review/rejection shall be resubmitted within 14 calendar days. Failure to resubmit items will result in the contractor being charged fifty dollars ($50) per day until submitted. After sixty (60) days, in addition to the $50/day Owner will direct the Architect and Construction Manager to acquire all corrected documentation and materials listed. The Contractor shall be liable to the Owner for all costs associated with this failure, refusal, or neglect, including Attorney, Architect and Construction Manager fees at their current hourly rates. The Contractor shall also be liable to the Owner for all turnover materials and special tooling cost due to completing the closeout matrix requirements.

1.9 ADDITIONAL NOTES TO THE CONTRACT DOCUMENTS

A. All bidders are required to thoroughly review all information in the contract documents, as well as visit the project sites. Errors and omissions on the part of the bidder **will not** be case for additional compensation.

B. All prime contractors should note that Performance Bonds and Labor/Material Payment Bonds will be required of all awarded contractors for each contract.

C. Review specification section for "Allowances" that may be included in Prime Contractors scope of work.

D. Review specification section for "Alternates" that may be included in Prime Contractors scope of work.

E. Review specification section for "Unit Prices" for unit pricing required in Prime Contractors scope of work.

F. Review Division 01 specification section for "Temporary Facilities" for work requirements of temporary construction activities in Prime Contractors' scope of work.

G. Prime contractors are responsible for the layout and survey of their own work or work requirements unless noted otherwise.

H. Prime contractors are required to construct the project per the agreed upon schedule, phasing and staging plan. Specific areas of the site and building must be completed for the intended use by the District, at the Milestone Dates so listed. Contractors shall cooperate fully with the intentions of the plan. Contractors are forewarned that any delay caused indirectly or directly by the acts, omissions, and/or failure to perform by a contractor will result in the Owner, or its agents, accomplishing the work by any means possible. The contractor causing the delay will be responsible for any and all costs associated with such issues, including Owner costs, Architect/Engineer costs, inspections, etc.

I. Prime contractors shall provide temporary shoring, bracing, supports or protection systems necessary to expedite the work requirements including the maintenance of worker safety.

J. Prime contractors are responsible for the safety of their own workers, subcontractors, work area, and other personnel on site. Each contractor is responsible for maintaining a safe work site and utilizing best safety procedures.

K. Each prime contractor is responsible for information provided in the contract drawings and specifications noted and attached within. Information may be indicated on one drawing or across several drawings. consequently, each and every prime contractor is responsible for information on each and every drawing so listed on the enumeration of drawings on sheet number “Index” entitled drawing Index.

L. All Prime Contractors are required to clean their own work area at the end of each workday. Each contractor will place the debris in an onsite dumpster. . Failure to comply with cleaning requirements will activate Owner remedies, including back charges to the responsible contractor(s). Advance notification is not required to implement these measures

M. Excavation, backfilling, and compaction of excavations required to perform subgrade work shall be the responsibility of the Contractor requiring the excavation. Coordinate backfilling and compaction with the Construction Manager to assure proper scheduling of required testing.

N. In case of discrepancy between the Drawings and Specifications or elsewhere in the contract documents, interpretation shall be given preference in the following order with later dates taking precedence over earlier dates:
   1. Addenda
   2. Amendments to the Drawings and Specifications
   3. Drawings and Specifications
   4. Schedules, Piping and Wiring Diagrams take precedence over other data shown on the drawings.
   5. Notes take precedence over other data shown on the drawings, except schedules, piping and wiring diagrams.

O. If discrepancies are found between the plans and specifications or elsewhere in the contract documents, the prime contractor shall include the “greater quantity”, “greater quality”, or “more costly” detail to the bid price.

P. Each Prime Contractor and Subcontractor is responsible for providing adequate manpower as needed throughout the course of the project to maintain the overall construction schedule and milestone dates.

Q. Prime contractors should note that the project is applicable to all prevailing wage rates (see section 007340 for wage rate schedule). Contractors will be required to submit with each month’s payment application, certified payroll reports for their own employees, as well as those of any subcontractors utilized. Failure to provide reports will cause rejection of a contractor’s payment application.

R. Contractor progress billing will be carried out using the AIA G732 form, and AIA G703 Continuation Sheets. All contractors will be required to submit a pencil copy by e-mail to the Construction Manager by the 20th of the month for review. After the pencil copy is reviewed by the CM/Owner/Architect/Engineer, the contractor will be notified to make corrections (if any) found. Once notified, the contractor will submit by e-mail by the twenty-fifth (25th) of the month: notarized copy with all required attachments including certified payroll reports, signed lien waiver form (see section 012900), and the signed red-line drawing verification form after updates are made (see section 012900). Should the contractor miss the required monthly submission dates, the payment application would be considered late and would be payable in the next month’s cycle.

S. Concerning the submission of project closeout data: Refer to 017700 for closeout requirements.

T. Each Prime Contractor should note that this project is New York State Tax Exempt, for all materials that will be incorporated into the work of each contract.

U. All Prime Contractors performing subgrade work shall request utility underground location stakeout well in advance of excavation beginning. A private Underground Utility Locating Contractor shall be hired by the Prime Contractor performing subgrade work, to locate District’s private underground utilities. Contractors will be responsible for maintaining stakeout location marks throughout construction, as well as noting those utility locations and their depths on the master red-line as-built drawing set in the CM’s site office.

V. Contractors are notified that the dry-cutting of masonry or gypsum-based products with rotary cutting equipment is prohibited on the project site.

W. Plumbing, Mechanical (HVAC) and Electrical Contractors are responsible for coordination of their work. Coordination drawings in accordance with the contract documents; shall be generated within 45 days after execution of contracts by the Mechanical (HVAC) Contractor, Plumbing Contractor and Electrical Contractor without delay after award of contract. Approval of ductwork, piping, equipment, and conduit submittals will be contingent upon final review of the required Mechanical, Plumbing and Electrical coordination drawings. A line item for the coordination drawings will be identified with a cost on each contractor's schedule of values. The Mechanical Contractor will initiate and complete coordination drawings on read/write electronic files purchased at their expense from the architect if the architect has a fee to provide these files. The Mechanical Contractor will forward mark up electronic files and hard copy coordination drawings to the Plumbing and Electrical Contractors. The Electrical Contractor, after including all of its necessary coordination information, shall then forward the electronic files and hardcopy coordination drawings to the Plumbing and Mechanical Contractors with a transmittal. The Plumbing Contractor shall do the same as the Mechanical Contractor and Electrical Contractor and forward completed electronic files and coordination drawings to the Mechanical Contractor who will produce enough copies (2 to each contractor) and issue as a submittal to the Architect and CM.

X. Substitutions/Equivalency: Each prime contractor shall cooperate with other contractors involved to coordinate approved equivalency substitutions with remainder of the work.
   1. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Division 01 Section "Temporary Facilities", each prime contractor is responsible for the following:
   2. The contractors shall assist the Architect, Construction Manager, and Owner in identifying a plan detailing how exiting required by the applicable building code will be maintained, and a plan detailing how adequate ventilation will be maintained during construction.
   3. Installation, operation, maintenance, and removal of each temporary facility usually considered as its own normal construction activity, and costs and use charges associated with each facility.
   4. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
   5. Its own field office, complete with necessary furniture, utilities, and telephone service. The Contractor shall provide leveling, stone, and/or removals necessary to install Field Offices. At end of construction, when field offices are removed, each Contractor is responsible to return the area to its original condition, including any re-seeding required.
   6. Its own storage and fabrication sheds.
   7. Temporary enclosures for its own construction activities.
   8. Hoisting requirements for its own construction activities, including hoisting material or equipment into spaces below grade, and hoisting requirements outside building enclosure.
   9. Progress cleaning of its own work areas on a daily basis.
   10. Secure lockup of its own tools, materials, and equipment.
   11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

Y. Extent of Multiple Prime Contracts: Unless the Agreement contains a more specific description of the work, name and terminology on Drawings and in Specification sections determine which contract includes a specific element of the project.

Z. All Prime Contractors shall have their own on-site printing capabilities.

AA. Each Prime Contractor shall provide the CM a copy of all approved shop and coordination drawings on the appropriate size paper.

1.10 ACCESS AND USE OF SITE

A. General: Contractor shall have limited use of project site for construction operations as indicated on drawings by the contract limits and as indicated by requirements of this section.

B. Comply with all requirements of "Codes, Rules and Regulations of the State of New York, Title 8 Education Department, Chapter 11, Subchapter J, Part 155.5 - Uniform Safety Standards for School Construction and Maintenance Projects:
   1. "The general portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy."

   2. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos.

   3. "General safety and security standards for construction projects.
      a. All construction materials shall be stored in a safe and secure manner.
      b. Fences around construction supplies or debris shall be maintained.
      c. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
      d. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
      e. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites."

   4. "Separation of construction areas from occupied spaces. Construction areas, which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy-duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
      a. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridor, stairs or elevators designated for student or school staff use.
      b. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
      c. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session."

   5. A plan detailing how exiting required by the applicable building code will be maintained.

6. A plan detailing how adequate ventilation will be maintained during construction.

7. "Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are occupied or acoustical abatement measures shall be taken."
8. "The contractor shall be responsible for the control of chemical fumes, gases and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes."

9. "The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glue, paints, furniture, carpeting, wall covering, drapery, etc. that are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied."

10. "Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied." Note: it is NYSED's interpretation that the term "building", as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier. Exterior work such as roofing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at window is provided. Care must be taken to schedule work so that classes are not disturbed by noise or visual distraction.

11. Surface that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, work site preparation, work methods, cleaning and clearance testing which are in general accordance with HUD Guidelines.

12. Contractor parking is job specific and depending on parking availability, a designated contractor parking area may be required. Parking availability for contractor may change depending on the needs of the Owner.

C. Use of Site: Limit use of project site to areas within the contract limits indicated. Do not disturb portions of project site beyond areas in which the work is indicated.
   1. Limits:
      a. Arrange use of site and premises to allow:
         i. Owner Occupancy
         ii. Work by others
         iii. Use of site and premises by the public

      b. Emergency Building Exits During Construction:
         i. Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
         ii. All exit and escape windows shall be maintained at all times.
         iii. Do not obstruct roadways, sidewalks, or other public right-of-ways without a permit.
         iv. Do not use driveways, sidewalks or designated entrances for parking or storage of materials.

c. Keep temporary driveways and entrances serving the premises clear and available to the Owner, Architect, Construction Manager and emergency vehicles at all times.

2. Comply with all Regulations of Commissioner or Education, 8NYCRR Part 155.

3. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
   c. Limit deliveries to times other than **45** minutes before school begins and **15** minutes after school begins and from **15** minutes before school lets out to **45** minutes after school lets out.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

E. Conditions of Existing Building: Maintain portions of the existing building affected by construction operations in a weather tight condition throughout the construction period. Repair damage caused by construction operation. The building must be made weather tight and secure at the end of each day.

1.11 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will be vacating the construction area for renovations starting on the last day of school as per the schedule and will be returning to different sections of the building as per the schedule.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

   2. Notify Construction Manager not less than seventy-two (72) hours in advance of activities that will affect Owner's operations. Any work that requires disruption to the occupants, entry/exits etc. shall be coordinated with and approved in writing by the Construction Manager.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
   1. The architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.

   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.

3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work. However, the District will not clean up behind contractors: Responsibility for any debris caused by contractor operations remains with the prime contractor.

1.12 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours while building is not "In Session" (summers, breaks and holidays): Limit work at the site to normal business working hours of 7:00 AM to 4:00 PM, Monday through Friday, unless otherwise indicated or work scheduled interferes with the owner's schedule.
   1. Weekend Hours: May occur with written permission from Construction Manager.
   2. Early Morning Hours: May occur with written permission from Construction Manager unless specific requests violate restrictions or regulations by authorities having jurisdiction.
   3. Hours for Utility Shutdowns: As coordinated with the Construction Manager.
   4. Hours of Noisy activity: As coordinated with the Construction Manager.
   5. Work between the hours of 3:00 PM and 7:00 AM may occur with written permission from the Construction Manager.

C. On-Site Work Hours while building is "In Session" (typically September – July when kids attend school): Limit work at the site to B Shift working hours of 3:30 PM to 11:30 PM, Monday through Friday, unless otherwise indicated or work scheduled interferes with the owner's schedule.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Construction Manager not less than two days in advance of proposed disruptive operations.

E. Obtain Construction Manager's written permission before proceeding with disruptive operations.
   1. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   2. Notify Construction Manager not less than two days in advance of proposed disruptive operations.

F. All additional costs for overtime, second or third shift work required by any contractor to ensure work completion in accordance with the project completion dates will be the responsibility of the contractor. All contractors are to note that second and/or third shift work will be required to perform the scope of this work.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site. Background checks are to be provided by the

Prime Contractor for all personnel and subcontractor personnel. Prime Contractor is solely responsible for all screening costs.

1. All workers at the site will be subject to background checks through the District's software system. Workers shall also submit a copy of their driver's license or legal ID with current residence listed to the Construction Manager. This information will not be shared with any other entity but will be checked against the sexual predator registry. Any worker listed as a sexual predator will not be allowed to work at the site.
2. Maintain a list of approved screened personnel with Construction Manager and Owner's representative. The list must be updated within twenty-four (24) hours of a new individual being on the site.

1.13 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by the Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

1.14 MISCELLANEOUS PROVISIONS

A. Work Sequence:

   1. Work will be conducted in a manner to provide the least possible interference to the activities of the Owner’s personnel and to permit the facilities to be partially utilized during implementation of the work.

   2. The Contractor is expressly forewarned that impacts to the construction schedule during any phase or portion of the project will not be permitted. All Contractors are required to construct the project per the phasing plan. Contractors must make the site and building for use by the District on or before the dates listed in the Phased Construction Milestone Schedule. All Contractors shall cooperate fully with the intentions of the plan. All Prime Contractors are specifically forewarned that any delays caused directly or indirectly by their acts, omissions, and/or failure to perform will result in the District, or its agents, completing the Prime Contractor's work by whatever means are needed to complete the work. The Prime Contractor causing the delay will be responsible for any and all costs associated with such issues including, but not limited to, District, Architectural, Construction Management, Legal,

and Inspections costs, plus costs submitted by Contractors hired to complete the Prime Contractor's work-in specific areas.

3. Schedule: Refer to the Guideline Milestone schedule included in Division 01 Section.

4. Additional costs for overtime, second or third shift work required to ensure work completion in accordance with the project completion dates shall be the responsibility of the contractor. The Construction Manager shall have the authority to direct the contractors and subcontractors to work overtime including weekends to maintain the schedule at no additional cost to the Owner. Prime Contractors warrant that the work shall be physically complete, including punch list, startup, and commissioning, within the early start and late finish schedule milestones.

5. Each Prime Contractor shall provide multiple crews to maintain project schedule. Each crew is to be furnished with its own supervision, cranes, scaffold, and other means necessary to maintain the Project Schedule.

6. The intention of the work is to follow a logical sequence; however, the Prime Contractor may be required by the Construction Manager to temporarily omit or leave out any section of his work or perform his work out of sequence. All such out of sequence work and returning to these areas shall be at no additional cost to the Owner.

B. Requirements of Contracts:
   1. All contractors are responsible for the layout and survey of their own work, unless otherwise noted elsewhere in the Contract Documents.
   2. Each Contractor shall provide any temporary shoring, bracing, supports, or protection systems needed to complete the work of their Contract. All Contractors are responsible, individually, and collectively, for maintaining safe working conditions at all times.
   3. Each Contractor is required to implement and maintain a project specific safety program. Each Contractor shall submit their safety program to the Construction Manager for review, prior to the start of the work of their Contract. The program shall include company safety philosophy, history, action plan, manuals, hazardous communications sheets, OSHA filings, MSDS sheets for all materials to be used on the project, safety meeting minutes and a reporting system for any accidents or injuries.
   4. Each prime contractor shall provide a competent field superintendent at the site while work is being performed. When Project consists of multiple site locations a competent supervisor shall be present at each site while work is being performed. Prime Contractor’s Field Superintendent and/or support staff shall become familiar with ProCore Management software. Individuals will be responsible to access, view and upload information/documents including but not limited to requests for information, submittals, shop drawings, and proposal pricing.
   5. Unless otherwise indicated, the Work described in this section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
   6. Sitework utilities for all building additions is the responsibility of the site contractor’s contract and starts 5’ outside the foundation perimeter wall of each of the buildings additions, unless otherwise noted. Each prime contractor is responsible for and shall make final connections to the storm lines, foundation drains, water, gas, sanitary, and fire protection, lines from foundation wall to the point of 5’ outside of the addition perimeter unless otherwise noted.

7. Cutting and patching for the Work of each contract shall be provided by each contractor for its own Work unless noted otherwise. Patching shall mean restoring surfaces to match adjacent or ready to accept new finishes as scheduled.
8. Unless otherwise indicated, the Word described in this section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
9. Local custom and trade-union jurisdictional settlements do not control the scope of the Work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruption and delays.
10. Trenches for the Work of each contract shall be provided by each contractor for its own Work unless noted otherwise.
11. Cutting and patching for the Work of each contract shall be provided by each contractor for its own Work unless noted otherwise. Patching shall mean restoring surfaces to match adjacent or ready to accept new finishes as scheduled.
12. Firestopping for the Work of each contract shall be provided by each contractor by an employee certified for use of firestopping product.
13. Each Prime Contractor shall be responsible for firestopping of all penetrations related to their work in accordance with applicable specification sections, Federal, State and local Code requirements.
14. Within ten (10) working days after preliminary horizontal bar-chart-type construction schedule submittal has been received from General Trades Contractor, submit a matching preliminary horizontal bar-chart schedule showing construction operations sequenced and coordinated with overall construction.
15. Dewatering is the responsibility of each contractor requiring it.
16. All prime contractors will be responsible to maintain and update a master red-line set of as-built drawings, on a monthly basis as a condition of payment. The master redline set will be kept in the construction manager's site office. Just prior to the payment application being sent, each contractor will have their site representative update the drawings with any and all changes made during the month including posting all change order work, field directives, sketches issued, Requests for Information (RFI) answers received, etc. Following the monthly-required update, the contractor's representative will sign a Construction Manager form to verify that all updates have been made. This signed form is to be included with the contractor's submission of his original payment application each month. Red Line set shall be scanned and submitted as part of the closeout documentation.
17. Any changes submitted for additional work that are either requested by the Owner, CM, Architect/Engineer or Contractor generated will require detailed backup to be submitted for a proper review to be made. The detailed backup would include the following as example:
    a. Labor: Number of hours X manpower X hourly rate (including benefits) = Total labor cost
    b. Material: Number of "widgets" X unit cost =Total material cost
    c. Equipment: Equipment X number of "time" X cost / "Time" X number of "Time" = Total equipment cost. "Time" can represent hours, days, weeks or months.
    d. Subcontractor quote: Attach subcontractor quote which will also contain the same level of detail and backup stated above.
    e. Specified overhead/profit percentages = total OH&P
    f. Grand total quotation = $_____.
        1) Any quote received in a "lump sum" format without a detailed cost breakout will be rejected and returned. Also, a contractor should be cautioned not to proceed with a change until written approval has been received from the CM, Owner, or Architect/Engineer. If a contractor proceeds with a change of work without

approval, the contractor will have done so at their own risk without a guarantee of payment.

18. Time and material tickets for additional pre-approved work must be submitted for verification of time and materials within 2 days after completion of the work. This should be billed to the district within Thirty (30) days of completion of the work or work will be at a No Cost to the District.
19. All contractors are to maintain one dedicated employee as a fire watch during all torch cutting and welding activities on this project. The fire watch person shall remain on watch for no less than two (2) hours after the activity is completed. The worker shall not perform any other work other than firewatcher during this time. Comply with all requirements of Chapter 26 of the Fire Code of New York State.
20. The District has the right of first refusal for any equipment and/or materials to be disposed of. The responsible Prime Contractor shall move items to be saved items at their own expense to a location designated by the District.
21. Dust control must be maintained during all renovations.
22. Each Contractor shall be responsible for restoration of selective demolition of floors to approximately –1/8" of final finished floor elevation, unless otherwise noted in the Contract Documents. Walls shall be restored to a smooth uniform surface condition after selective demolition of items such as signs, tack strips, clocks, light fixtures, etc.
23. The General Contractor shall designate a man to secure/lock the building/construction site at the end of each work shift at each location. Worker shall close and lock all doors, gates and windows.
24. Each Prime Contractor's contract is active and will remain so, until the Architect authorizes a signed Substantial Completion Certificate.
25. Each Prime Contractor shall address "Deficient Items" and "Punch-List Items" within thirty (30) days of receipt of written notice from the Construction Manager. Failure to comply will result in issuance of the Owner's Right to Take Over Work Notice per Conditions and Contract Forms General Conditions of the Contract and corresponding Supplementary Conditions of the General Conditions of the Contract. The Owner will seek reimbursement for all cost associated with this action through a deduct change order. Reimbursement charges may include, but not be limited to, cost for labor and material associated with completing the work, architectural costs, construction management costs, and legal costs.
26. There are to be no temporary fuel tanks placed on any District property.
27. The Construction Manager will receive copies of all Prime Contractors daily reports on a weekly basis, listing daily activities and listing daily manpower by trade.
28. Contractors are prohibited from using District toilet room facilities.
29. Backfill of excavations in the building shall be done with an approved structural fill. Native material shall be removed from the site at the contractor's expense.
30. Each Prime Contractor shall supply and coordinate exact locations of embedded items in concrete or masonry work with the General Contract. Each Prime Contractor shall monitor such items throughout concrete/masonry activities to ensure proper placement.
31. Each Prime Contractor shall survey existing work and conditions and submit to the Construction Manager a written list of damaged areas (e.g.: ceiling tiles) prior to commencing work. Any damaged areas not identified prior to start of work shall be the responsibility of the Contractor/Contractors working in that area or above. Each Prime Contractor shall return areas disturbed by their work activities to the condition prior to start of Work.
32. All Contractors are responsible to replace ceilings and ceiling tiles they damage. The CM will be final arbitrator of the extent to which each contractor shall be responsible for replacement of ceiling tiles damaged. All ceilings and ceiling tiles will be replaced to match original. If contractors cannot agree to their level of responsibility, deduct change orders will be issued to each responsible contractor for the cost of replacement shared equally.

33. The wearing of hard hats is mandatory for all employees of a contractor, as well as other required personal protective equipment (PPE), in accordance with each contractor's individual company safety plan.
34. There is absolutely no use of any tobacco products (which includes smokeless tobacco, vapor devices & electronic smoking devices) on the work site or anywhere on the owner's property by New York State law. Should a contractor's employee be seen using tobacco on the owner's property, the responsible prime contractor will receive a $200.00 fine per incident, which will be deducted from their contract value by change order.
35. Alcohol, drugs, firearms, firearms, pornography, and use of foul language are strictly forbidden from the project. The District has zero tolerance for such actions. Possession or use of such will result in an immediate termination and permanent discharge from the project.
36. Each prime contractor is responsible for firestopping of all penetrations related to his work in accordance with applicable specification sections, Federal, State and Local code requirements.
37. Each prime contractor is responsible for providing joint sealants required for the work of his Contract as recommended by the manufacturer.
38. Each successful Prime Contract bidder shall submit resumes to the Construction Manager for the proposed project manager and field superintendent for the Project. This information shall be reviewed with the Owner, Architect and Construction Manager for approval. Should the Project Managers or Superintendents prove unqualified for the position at any point in the Project, the Construction Manager shall issue a letter stating that the person is to be removed from involvement in the Project. Action must be made within three (3) days of receipt of such letter. Each Prime Contractor is required to maintain a competent person on site when work is being performed. That person is to be responsible for the Contractor's operations.
39. Backfill of excavations in the building shall be done with an approved structural fill. Native material shall be removed from the site at the contractors' expense.
40. Each Prime Contractor shall supply and coordinate exact locations of embedded items in concrete or masonry work with the General Contract. Each Prime Contractor shall monitor such items throughout concrete/masonry activities to ensure proper placement.
41. All Prime Contractors shall maintain within their field office, as well as in each gang box; a current and complete set of Contract Documents posted with all addenda. Also available in these locations should be any Change Orders or other issued document modification's, reviewed copies of shop drawings, samples, color schedules and other data pertinent to the Project.
42. The General Contractor shall provide all interior and exterior masonry and brick patching/fill-in where necessary on the project. All brick work shall be toothed in and colors/finishes shall match existing.
43. Structural reinforcing at roof openings larger than 8"x 8" shall be by contractor providing opening unless noted otherwise in the documents. Sizing shall be H configuration, minimally 3"x 3" (5/16") welded angle iron connected to building structure at both ends.
44. Each Prime Contractor shall survey existing work and conditions and submit to the Construction Manager a written list of damaged areas (e.g.: ceiling tiles) prior to commencing work. Any damaged areas not identified prior to start of work shall be the responsibility of the Contractor/Contractors working in that area or above. Each Prime Contractor shall return areas disturbed by their work activities to the condition prior to start of Work.
45. All Prime Contractor employee's and their subcontractor's employees are required to wear picture identification badges at all times while on site. ID Badges shall be provided by each Prime Contractor and shall have employee Name, photo identification and Contractor name on ID. Contractor's employee's working at the site shall provide a copy of a valid driver's license or equivalent legal identification to Construction Manager. All employees will be checked against the Registered Sex Offender Data Base by the Prime Contractor prior to

accessing the site Prime Contractors are to provide written verification to the Construction Manager that the background checks have been completed for each employee. Any registered offenders will not be allowed at the work site.

46. The contractor making the penetration through existing partitions, walls or load bearing walls unless noted otherwise in the documents shall provide loose lintels. At minimum penetrations through walls with an opening larger than 12" horizontally will require a lintel unless noted otherwise in the documents.
47. Structural reinforcing shall be provided by contractor making penetration through the floor slab, roof deck, wall, partition, or load bearing wall unless noted otherwise in the documents. All openings larger than 10" x 10" shall be structurally reinforced.
48. The New York State Education Department requires School Districts to establish a Health and Safety Committee to monitor safety during school construction projects. This committee will consist of School Administrators, Teachers, and others. During actual construction, this committee can be expanded by the Board of Education of a particular School District to include the Project Architect, the Construction Manager, and the Prime Contractors. This committee will meet periodically to review and address issues related to health and safety related to the construction project. Each Prime Contractor is to cooperate with the rulings of the committee and participate when asked to do so.
49. The State Education Department has established a rule that noise levels due to construction activity cannot exceed 60 dBA when measured with type 2 sound level meter, in areas occupied by school students or the school's staff. All Prime Contractors need to anticipate construction activities that will produce noise levels above 60 dBA and schedule this work accordingly when students and staff are not present. Any construction noise that exceeds 60 dBA in school occupied areas will be shut down by the CM, and the responsible Prime Contractor will be asked to perform the operation when the area is not occupied by the school. No additional compensation will be allowed for compliance with this regulation.
50. There will be NO contact between the Contractor or their personnel and any of the school's student or staff. The Contractors are not to take direction from anyone but the Construction Manager.
51. In the interest of the safety of each contractor and his employees, as well as the safety of building occupants, all contractors need to be aware of Owner's policies concerning Building Lock-Down and Building Lock-out. Each Contractor and their employees will be required to adhere to the district's policies without exception, in the event that a situation occurs which requires these policies to be employed, or when a scheduled readiness drill may occur.

PART 2 - EXECUTION

2.1 CONSTRUCTION MANAGER

A. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager.

B. Coordination activities of the Construction Manager include but are not limited to the following:
   1. Provide overall coordination of the Work.
   2. Provide overall coordination of temporary facilities and controls.
   3. Coordinate, schedule and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
   4. Coordinate construction and operations of the Work with work performed by each contract.

5. Coordinate sequencing and scheduling of the Work. Include the following:
   a. Initial Coordination Meeting: At earliest possible date, arrange and conduct a meeting with separate contractors for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.
   b. Distribute copies of final schedules to Architect, Owner, and separate Prime Contractors.
   c. Provide daily field reports with construction photography.
   d. Coordinate sequence of activities to accommodate tests and inspections and coordinate schedule of tests and inspections.
   e. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
   f. Coordinate cutting and patching.
   g. Coordinate protection of the Work.
   h. Review monthly AS-BUILT updates.

2.2 COORDINATION

A. Each Prime Contractor shall cooperate with and coordinate with the other Prime Contractors who will, under separate contract with the Owner provide certain equipment and materials. Coordinate the interface of the Contract work with the work with the work of other Prime Contractors. Schedule work to avoid any delays in the overall completion of the schedule that may result from the inability of the other Contractors or Suppliers to access the building or site to properly install their equipment within the time frame of the Construction Schedule.

B. Each Prime Contractor shall supply and coordinate exact locations of embedded items in concrete or masonry work with the General Contractor. Each Prime Contractor shall monitor such items throughout concrete/masonry activities to ensure proper placement.

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Contingency allowances.

C. Related Requirements:

1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight**,** and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by the Architect to the Construction Manager for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
1. All overhead and profit associated with the contingency allowance shall be included in the base bid. The contingency allowance shall be used for construction cost only (See Item B).

B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are as follows:
1. Cost of Product(s) to Contractor less any trade discounts.
2. Cost of delivery to site, on-site handling, unloading, uncrating, and storage.
3. Cost of applicable taxes.
4. Protection from the elements or from damage.
5. Labor costs for installation, finishing, and testing; except where labor is specified not to be included in the allowance.

6. Subcontractor’s overhead and profit (only) at the stipulated rate of 15%. Prime contractors are entitled to one markup per subcontractor per change event. Subcontractors that contract out work are not entitled to additional overhead and profit beyond that noted above.

C. Change Orders and Change Directives authorizing use of funds from the contingency allowance will include Contractor's related costs only as described above.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES

A. General Construction Contract:

1. Allowance G-1, Contingency Cash Allowance: Include a lump sum allowance of $375,000 for use upon the Owner's instructions. **This allowance is to be included in the Base Bid.**

2. Allowance G-2, Dumpster Cash Allowance: Include a lump sum allowance of $75,000 for use upon the Owner's instructions toward dumpster expenses. **This allowance is to be included in the Base Bid.**

3. Allowance G-3, Signage Cash Allowance: Include a lump sum allowance of $140,000 for use upon the Owner's instructions toward building signage using a sign vendor selected by the District. **This allowance is to be included in the Base Bid.**

B. Plumbing Contract:

1. Allowance P-1, Contingency Cash Allowance: Include a lump sum allowance of $10,000 for use upon the Owner's instructions. **This allowance is to be included in the Base Bid.**

C. HVAC Contract:

1. Allowance H-1, Contingency Cash Allowance: Include a lump sum allowance of $350,000 for use upon the Owner's instructions. **This allowance is to be included in the Base Bid.**

D. Electrical Contract:

1. Allowance E-1, Contingency Cash Allowance: Include a lump sum allowance of $500,000 for use upon the Owner's instructions. **This allowance is to be included in the Base Bid.**

E. Site Work Contract:

1. Allowance L-1, Contingency Cash Allowance: Include a lump sum allowance of $350,000 for use upon the Owner's instructions. **This allowance is to be included in the Base Bid.**

2. Allowance L-1, Vegetation Cash Allowance: Include a lump sum allowance of $300,000 for use in vegetation removal and site restoration upon the Owner's instructions. **This allowance is to be included in the Base Bid.**

END OF SECTION 012100

SECTION 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material**s**, plus cost**s** for delivery, installation, and taxes (when applicable)

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Site Work Contract:

1. UNIT PRICE NO. L-1 4" STORMWATER MANAGEMENT TRENCH (SMT):

a. Description: Furnish and install new 4" Stormwater Management Trench (SMT) piping, filter fabric and drainage backfill as described in Section 334001 and as detailed. This includes trenching and removals.

b. Unit of Measurement: Linear foot, installed.

2. UNIT PRICE NO. L-2 UNDERCUTTING:

a. Description: Undercutting where unsatisfactory soils are discovered. This includes excavation, removal and haul away of unsuitable material, backfill and compaction with suitable granular material as specified in Section 311201. Note: 2,000 cubic yards of undercutting to be included in the base bid.

b. Unit of Measurement: Cubic yard, installed.

3. UNIT PRICE NO. L-3 SOIL STABILIZATION FABRIC:

a. Description: Furnish and install new woven Soil Stabilization Fabric as described in Section 321201.

b. Unit of Measurement: Square yard, installed.

4. UNIT PRICE NO. L-4 MEDIUM DUTY ASPHALT:

a. Description: Furnish and install new Medium-Duty Asphalt, stabilization fabric and stone sub-base as described in Section 321201 and as detailed. This includes excavation and removals for placement of medium-duty asphalt.

b. Unit of Measurement: Square yard, installed.

5. UNIT PRICE NO. L-5 HEAVY DUTY CONCRETE SIDEWALK:

a. Description: Furnish and install new Heavy-Duty Concrete Sidewalk(s) as described in Section 321301 and as detailed. This includes excavation and removals for placement of heavy-duty concrete walks.

b. Unit of Measurement: Square foot, installed.

6. UNIT PRICE NO. L-6 ROCK EXCAVATION(S):

   a. Description: Rock excavation and removal off site as described in Section 312201. NOTE: 100 c.y. of rock excavation is in the Base Bid.

   b. Unit of Measurement: Per cubic yard open rock as measured in the ground prior to excavation.

B. General Construction Work Contract

1. UNIT PRICE NO. GC-01 – PIPE INSULATION ABATEMENT:

   a. Description: Indicate the cost to remove and dispose of Pipe Insulation within an existing containment work area. Work shall be performed as outlined in Section 028200 Removal and Disposal of Asbestos.

   b. Unit of Measurement: Per linear foot of pipe insulation removed.

2. UNIT PRICE NO. GC-02 – FLOOR TILE ABATEMENT:

   a. Description: Indicate the cost to remove and dispose of vinyl asbestos floor tile and associated mastic within an existing containment work area. Work shall be performed as outlined in Section 028200 Removal and Disposal of Asbestos.

   b. Unit of Measurement: Per square foot removed.

3. UNIT PRICE NO. GC-03 – TRANSITE PANEL ABATEMENT:

   a. Description: Indicate the cost to remove and dispose of transite panels from the building exterior. Work shall be performed as outlined in Section 028200 Removal and Disposal of Asbestos.

   b. Unit of Measurement: Per Square foot removed.

4. UNIT PRICE NO. GC-04 – EXTERIOR CAULK ABATEMENT:

   a. Description: Indicate the cost to remove and dispose of ACM caulk. Work shall be performed as outlined in Section 028200 Removal and Disposal of Asbestos.

   b. Unit of Measurement: Per Square foot removed.

5. UNIT PRICE NO. GC-05 – DUCT INSULATION ABATEMENT:

   a. Description: Indicate the cost to remove and dispose of Duct Insulation. Work shall be performed as outlined in Section 028200 Removal and Disposal of Asbestos.

   b. Unit of Measurement: Per square foot removed.

6. UNIT PRICE NO. GC-06 – CONSTRUCTION OF MINOR CONTAINMENT:

   a. Description: Indicate the cost to construct a tent enclosure for a minor quantity friable abatement. Work shall be performed as outlined in Section 028200 Removal and Disposal of Asbestos.

   b. Unit of Measurement: Per minor tent enclosure constructed.

7. UNIT PRICE NO. GC-07 - PARTIAL-DEPTH CONCRETE RESTORATION: VERTICAL SURFACES

   a. Description: Partial-depth restoration of existing steel-reinforced cast-in-place structural concrete vertical surfaces (such as walls, piers, columns) as described in Section 030130.71. For bidding purposes assume depth of restoration to be uniformly 3 inches deep and requires concrete removal behind existing reinforcing steel to provide ¾" minimum clearance. Existing reinforcing steel shall be assumed to be corroded less than 15 percent, thereby not requiring replacement. Include all removal / prep work and application of approved restoration materials, followed by curing procedures and cleanup.

   b. Location: Existing building crawlspace

   c. Unit of measurement: Per square foot, installed.

8. UNIT PRICE NO. GC-08 - PARTIAL-DEPTH CONCRETE RESTORATION: HORIZONTAL SURFACES

   a. Description: Partial-depth restoration of existing steel-reinforced cast-in-place structural concrete horizontal surfaces (such as top surface of slabs) as described in Section 030130.71. For bidding purposes assume depth of restoration to be uniformly 3 inches deep and requires concrete removal behind existing reinforcing steel to provide ¾" minimum clearance. Existing reinforcing steel shall be assumed to be corroded less than 15 percent, thereby not requiring replacement. Include all removal / prep work and application of approved restoration materials, followed by curing procedures and cleanup. Base bid quantities are indicated on the drawings.

   b. Location: Existing building ground floor

   c. Unit of measurement: Per square foot, installed.

9. UNIT PRICE NO. GC-09 - PARTIAL-DEPTH CONCRETE RESTORATION: OVERHEAD SURFACES

   a. Description: Partial-depth restoration of existing steel-reinforced cast-in-place structural concrete overhead surfaces (such as underside of slabs) as described in Section 030130.71. For bidding purposes assume depth of restoration to be uniformly 3 inches deep and requires concrete removal behind existing reinforcing steel to provide ¾" minimum clearance. Existing reinforcing steel shall be assumed to be corroded less than 15 percent, thereby not requiring replacement.

Include all removal / prep work and application of approved restoration materials, followed by curing procedures and cleanup.

b. Location: Existing building crawlspace

c. Unit of measurement: Per square foot, installed.

10. UNIT PRICE NO. GC-10 - FRP REINFORCEMENT ON TOP SURFACE OF CONCRETE SLAB

a. Description: Install additional fiber-reinforced polymer (FRP) reinforcement on top surface of structural concrete slab. See Typical Details on Structural Drawings and Section 030130.72. Include all removal / prep work and application of approved restoration materials and cleanup. Assume removal of existing non-structural concrete topping and floor finish is required, with replacement in-kind.

b. Location: Existing building ground floor

c. Unit of measurement: Per linear foot, installed.

11. UNIT PRICE NO. GC-11 - FRP REINFORCEMENT ON BOTTOM SURFACE OF CONCRETE SLAB

a. Description: Install additional fiber-reinforced polymer (FRP) reinforcement on bottom surface of structural concrete slab. See Typical Details on Structural Drawings and Section 030130.72. Include all removal / prep work and application of approved restoration materials and cleanup.

b. Location: Existing building crawlspace

c. Unit of measurement: Per linear foot, installed.

12. UNIT PRICE NO. GC-12 – CONCRETE FOUNDATION PIER REPAIR BY JACKETING

a. Description: Perform jacketing of concrete pier in crawlspace as shown on Detail A1/CS1.02. Assume jacket height of 8 feet. Include as-needed excavation to top of existing footing, loose concrete removal / prep work, doweling, reinforcing, forming, concrete placement, curing and cleanup.

b. Location: Existing building crawlspace

c. Unit of measurement: Per concrete pier, installed.

13. UNIT PRICE NO. GC-13 – METAL PAN STAIR TREAD RECONSTRUCTION

a. Description: Provide all demolition and construction to reconstruct metal pan stair tread per Detail A5/ A_A4.01.

b. Location: Existing CNS HS stairs

c. Unit of measurement: Per tread, installed. (assume tread width of 5'-6")

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.

2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Sitework Contract

1. **Alternate LC-01: Gillette Road Middle School Softball Field:** The Bidder shall state the amount to be ADDED to the Base Bid to furnish and install equipment and markings to support the use of the synthetic turf field for softball as shown on the plans and as specified. This includes but is not limited to synthetic turf field markings, bases, softball backstop and 15' team benches. Note: If this Alternate is NOT accepted by the Owner, only Base Bid work shall occur in this area.

2. **LC-02 Gillette Road Middle School Baseball Backstop**: The Bidder shall state the amount to be ADDED to the Base Bid to furnish and install Tension Net Backstop for baseball as shown on the plans and as specified in lieu of a chain link fence baseball backstop. This includes but is not limited to fencing, footings, and tension net system. Note: If this Alternate is NOT accepted by the Owner, the Base Bid chain link fence baseball backstop shall be installed as shown on the plans and as specified.

3. **LC-03 Gillette Road Middle School Dugouts**: The Bidder shall state the amount to be ADDED to the Base Bid to remove existing dugouts, furnish and install new dugouts as shown on the plans and specified. This includes but is not limited to removal of existing dugouts and footings, installation of new modular dugouts and associated equipment. Note: If this Alternate is NOT accepted by the Owner, the existing dugouts are to remain and be protected.

4. **LC-04 Gillette Road Middle School Stairs**: The Bidder shall state the amount to be ADDED to the Base Bid to remove existing stairs and install new stairs as shown on the plans and as specified. This includes but is not limited to pavement removal, earthwork, and concrete work. Note: If this Alternate is NOT accepted by the Owner, no work shall occur in this area.

5. Bidder shall state the amount to be **added to** the Base Bid to TBD.

B. General Construction Contract

1. **Alternate GC-01 CNS High School Stair Curtain Wall:** Bidder shall state the amount to be ADDED to the Base Bid to replace CNS High School curtain walls at Stair C111.1 (CW-04) and Stair A147 (CW-01) as indicated in bid documents.

2. **Alternate GC-02 Gillette Rd MS Pier Reconstruction:** Bidder shall state the amount to be ADDED to the Base Bid to reconstruct Gillette Road MS existing concrete piers (at Crawlspace) as indicated in bid documents.

3. **Alternate GC-03 Gillette Rd MS Foundation Reconstruction:** Bidder shall state the amount to be ADDED to the Base Bid to reconstruct Gillette Road MS Area C existing foundation wall as indicated in bid documents.

4. **Alternate GC-04 CNS High School Entry Reconstruction:** Bidder shall state the amount to be ADDED to the Base Bid to reconstruct (2) CNS High School entries including stairs, landings, brick veneer, storefront and entrance door systems complete as indicated in bid documents.

5. **Alternate GC-05 Gillette Rd MS Flooring Replacement:** Bidder shall state the amount to be ADDED to the Base Bid to replace existing VCT flooring at (48) Gillette Road MS Classrooms in Areas 'C' and 'E' with new LVT as indicated in bid documents.

C. Electrical Contract

1. **Alternate EC-01 Gillette Rd MS Lighting Replacement:** Bidder shall state the amount to be ADDED to the Base Bid to replace existing Gillette Rd MS lighting with new LED fixtures at areas of full ceiling replacement as indicated in bid documents.

2. **Alternate EC-02 Gillette Rd MS Exterior Lighting:** Bidder shall state the amount to be ADDED to the Base Bid to provide lighting at Gillette Road MS auxiliary parking lot as indicated in bid documents.

3. **Alternate EC-03 Gillette Rd MS Athletic Lighting:** Bidder shall state the amount to be ADDED/ DEDUCTED to the Base Bid to provide specified basis of design athletic field lighting (Musco) at Gillette Rd MS as indicated in bid documents.

4. **Alternate EC-04 Gillette Rd MS Dugout Power:** Bidder shall state the amount to be ADDED to the Base Bid to provide electrical infrastructure to athletic field dugouts (replaced as part of Alternate LC-03) as indicated in bid documents.

END OF SECTION 012300

SECTION 012500 – EQUIVALENCY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. “APPROVED EQUIVALENTS” refers to manufacturers, materials, products, systems or equipment approved by the Architect for use in place of those specified, prior to contract award.

B. "APPROVED SUBSTITUTIONS" refer to manufacturers, materials, products, systems or equipment approved by the Architect for use in place of those specified, after contract award.

C. Standard of Quality: Specified materials, products and equipment establish the standard of function, dimension, appearance and quality.

D. Burden of Proof of equivalency rests with the entity submitting the proposed equivalent.

E. Acceptance: The Owner and the Architect shall determine a product's acceptability.

1.3 RELATED SECTIONS

A. Instructions to Bidders.

B. Supplementary Instructions to Bidders.

C. Supplementary General Conditions.

D. Division 01 Section “Submittals.”

1.4 PRODUCT OPTIONS

A. Where products are specified by reference standards or by description only; select any product meeting those standards or description.

B. Where products are specified by “or equal”, or by naming one or more products or manufacturers:

1. Select one of the products or manufacturers named which complies with the requirements of the Specifications; or

2. Submit an equivalent product that has been approved by addenda. Bidders shall follow procedures as described in Article "EQUIVALENTS PROPOSED OR CONSIDERED DURING THE BIDDING PHASE".

3. Submit a product which, in the Bidder’s opinion, is equal in all respects, which product shall be subject to post award approval by the Architect. Bidder shall follow procedures

for approval of substitutions as described in Article "SUBSTITUTIONS PROPOSED AS "OR EQUALS" AFTER CONTRACT AWARD".

1.5 CONTRACTOR'S CERTIFICATION

A. The Contractor shall provide certification as follows for all proposed equivalents and substitutions made under any of the procedures specified herein.

1. The Contractor has investigated the proposed product and determined that it is equal to or superior in all respects to the product specified, and that it will perform adequately in the application indicated.

2. The Contractor will provide the same warranties or bonds for the equivalent/substitute as for the product specified.

3. For equivalents, the Contractor certifies that it waives all claims for additional costs related to the substitution which subsequently become apparent, or become necessary because of the failure of the substitution to perform adequately.

4. For substitutions, the Contractor certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent, or become necessary because of the failure of the substitution to performance adequately.

5. The Contractor will coordinate the installation of an accepted substitution in the work, and make such other changes in the work as may be required for installation to make the work complete in all respects, at no additional cost to the Owner.

6. The Contractor agrees to reimburse the Owner for additional costs from claims by other Prime Contractors resulting from incorporation of requested equivalents and substitutions.

7. The Contractor agrees to reimburse the Owner for all additional costs billed by the Architect or his consultants for the review of the substitution request(s), any redesign of the Work of this Contractor or associated Contractors, additional site visits related to the substitution request and for the work to prepare Change Directives or Change Orders."

1.6 EQUIVALENTS PROPOSED OR CONSIDERED DURING THE BIDDING PHASE

A. If a Bidder desires to obtain pre-bid approval of a product they deem equivalent to a specified product rather than bidding "at risk", the Bidder may do so during the bidding process by the procedure described herein; procedure as follows:

1. Form of Request: Use enclosed "Equivalency Request" form.

2. Request Submitted To: Architect.

3. Request Made By: **Prime** Contract Bidders of Record **only**; in writing.

4. Deadline: Requests received fourteen (14) days prior to date of receipt of Bids.

5. Notification of Approved Products: By Addendum.

6. Specifics: Incomplete information will be rejected and not reviewed. The burden of proof is on the submitter. Provide complete information.

7. Separate Requests: Use separate request form for each product request.

B. Product Equivalency: Answers to the following questions, prefaced by "(How) does (the use of) the proposed equivalent product or its manufacturer," shall be addressed by the submitter:

1. Serve the same function?

2. Affect other products and the Project as a whole? If so, what?

3. Have the same dimensions?

4. Have the same appearance?

5. Comply with the same codes and conform to the same standards?

6. Have same life expectancy?

7. How long has the product been produced as currently manufactured?

8. Where has the product been used locally? List Projects and Architects.

9. Have a history of past problems, and if so what was the remedy?

10. Affect other aspects of the construction?

11. Affect any details? What needs to be changed?

12. Require license fee or royalties.

13. Affect construction time?

14. Have a product warranty equal to the specified warranty?

15. Have a track record of standing behind the product and the warranty?

16. Vary or differ from specified product?

17. Benefit the Owner?

C. Any "equivalent" not approved by addenda (which action shall be at the contractor's risk) must be submitted to the Architect no later than 48 hours after receipt of bids.

1. The Bidder shall use the Equivalency Request form and shall respond in writing to all the concerns noted above.

2. After the 48 hour limit described above, similar submittals shall be deemed to be substitution requests.

1.7 SUBSTITUTIONS PROPOSED AS "OR EQUALS" AFTER CONTRACT AWARD

A. The following procedures apply after contract award.

B. For a period **not to exceed fourteen (14) calendar days** following the date of Contract Award, the Architect will consider written requests from the Prime Contractor (**only**) for product substitutions. The date of Contract Award shall establish the start of the fourteen (14) day period.

C. The materials, products and equipment described in the Contract Documents establish a standard of function, dimension, appearance and quality to be met by any proposed substitution.

D. Submit separate request for substitution on the "Substitution Request" form for each product which is proposed, supported with complete data, drawings and/or samples as appropriate, including written responses to the following concerns:

1. Justification of need for substitution.

2. Complete data substantiating compliance of proposed substitution with Contract Documents (five copies).

3. Comparison of the qualities of the proposed substitution with that specified, including size, weight, durability, performance and visual effect.

4. Changes and coordination required in other elements of work because of the substitution.

5. Effect on the construction schedule, including other Contracts.

6. Cost data comparing the proposed substitution with the product specified.

7. Any required license fees or royalties.

8. Availability of maintenance service and source of replacement materials.

9. Samples when requested.

10. Statement explaining how use of product is beneficial to Owner.

E. Provide Contractor's Certification as specified above.

F. The Architect will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution.

1. When substitution is not accepted, provide specified product.

1.8 PRODUCT LIST

A. After the substitution period has ended and the Architect has reviewed requests and responded in writing, the Contractor shall develop the Approved Product List.

1.9 SUBSTITUTIONS PROPOSED DURING THE CONSTRUCTION PHASE

A. The following procedures apply beyond fourteen (14) calendar days after Contract Award.

B. Requests for substitutions made during the construction period shall be considered only if needed to replace unavailable products.

C. Substitutions not properly approved and not authorized shall be considered defective and shall be replaced by specified products.

D. All costs for review, research and modification of details on the part of the Architect or any consultants shall be borne by the Contractor.

E. If substitute products are used, any and all associated costs shall be paid by the Contractor, including additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Prime Contractors, and similar considerations.

F. Submittal process described in this Section of the Specifications shall be followed. Submit the following:

1. Substitution Request Form. See the form included at the end of this section.

2. Written response to Architect’s questions / concerns.

3. All data requested.

4. Samples requested.

1.10 ARCHITECT’S REVIEW

A. Conditions: The Architect will receive and consider the Contractor's equivalent/substitution request when all or most of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

11. Where a proposed substitution involves more than one prime Contractor, each Contractor shall cooperate with the other Contractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.

B. Architect's Action: After receipt of the request for equivalent/substitution, the Architect will request additional information or documentation if necessary for evaluation of the request. Within two weeks of receipt of the request, or one week of receipt of the additional information or documentation, which ever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution.

1. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.

2. If a substitution changes the cost and/or schedule of the project, acceptance will be in the form of a Change Order.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 012500

☐ **Equivalency Request** ☐ **Substitutions Request** ***(check one)***

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Section Page Paragraph Description

The undersigned requests consideration of the following:

PROPOSED EQUIVALENT/SUBSTITUTION: _____

_____

_____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. Attach data in compliance with Division 01 Section "Equivalency."

Attached data also includes a description of changes to the Contract Documents that the proposed equivalent/substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

The proposed equivalent/substitution does not affect dimensions shown on Drawings.

The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested equivalent/substitution.

The proposed equivalent/substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

Maintenance and service parts will be locally available for the proposed equivalent/substitution.

The undersigned further states that the function, appearance, and quality of the proposed equivalent/substitution are equal or superior to the specified item.

Submitted by:

Signature: _____ For use by the A/E

Firm: _____ O Approved O Approved as noted

Address: _____ O Not Approved O Received too late

_____ By: _____

Date: _____ Date: _____

Telephone: _____ Remarks: _____

Attachments

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.

b. Submittal schedule.

c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect, **through Construction Manager** at earliest possible date, but no later than **seven** days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.

b. Name of Architect.

c. Architect's project number.

d. Contractor's name and address.

e. Date of submittal.

2. Arrange schedule of values consistent with format of [AIA Document G703] <Insert name and designation of standard form>.

3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.

b. Description of the Work.

c. Name of subcontractor.

d. Name of manufacturer or fabricator.

e. Name of supplier.

f. Change Orders (numbers) that affect value.

g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.

2) Materials.

3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of **five** percent of the Contract Sum.

a. Include separate line items under **Contractor and** principal subcontracts for Project closeout requirements in an amount totaling **five** percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.

10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect **and Construction Manager** and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**.

1. Submit draft copy of Application for Payment **seven** days prior to due date for review by Architect.

D. Application for Payment Forms: Use AIA Document G732-2019 and AIA Document G703 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Project Manual.

F. Application for Payment Forms: Use forms acceptable to **Architect**, **Construction Manager** and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **Architect** or **Construction Manager** will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

H. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.

c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

I. Transmittal: Submit **three** signed and notarized original copies of each Application for Payment to **Construction Manager** by a method ensuring receipt **within 24 hours**. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

K. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

L. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.

2. Schedule of values.

3. LEED submittal for project materials cost data.

4. Contractor's construction schedule (preliminary if not final).

5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.

6. Products list (preliminary if not final).

7. LEED action plans.

8. Schedule of unit prices.

9. Submittal schedule (preliminary if not final).

10. List of Contractor's staff assignments.

11. List of Contractor's principal consultants.

12. Copies of building permits.

13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

14. Initial progress report.

15. Report of preconstruction conference.

16. Certificates of insurance and insurance policies.

17. Performance and payment bonds.

18. Data needed to acquire Owner's insurance.

M. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

N. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.

4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."

6. AIA Document G707, "Consent of Surety to Final Payment."

7. Evidence that claims have been settled.

8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013200 – MATERIAL AND EQUIPMENT

1.0 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Products.

B. Transportation and Handling.

C. Storage and Protection.

D. Product Options.

E. Substitutions (See Submittals Section)

F. Systems Demonstration.

G. Testing, Adjusting and Balancing of Systems.

H. Material Safety Data Sheets.

1.2 RELATED REQUIREMENTS

A. Section 013300 - Submittals: Submittal of manufacturer's certificates.

B. Section 017700: Project Closeout.

1.3 PRODUCTS

A. Products include material, equipment and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification Section shall be the same manufacturer and type, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structure, except as specifically required or allowed by Contract Documents.

E. The term “Provide” shall mean to furnish and install and connect ready for intended use.

1.4 PRODUCT LABELS

A. When materials or equipment are specified to conform to ASTM, Federal or other reference specifications, the materials delivered to the site shall bear the manufacturer's printed labels stating that the materials meet the requirements of such referenced specifications.

B. In addition, submit, per Section 013300, written certification that such materials or equipment meet the requirements of such referenced specifications.

1.5 MANUFACTURER'S INSTRUCTIONS

A. When the Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including copies to the Architect and to the Owner's Representative.

B. Maintain one set of complete instructions at the job site during installation and until completion.

C. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

D. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.

E. Do not proceed with work without clear instructions.

1.6 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with the construction schedule. Coordinate deliveries to avoid conflict with the work and conditions at the site.

B. Deliver products in undamaged condition in manufacturer's original containers or packaging with identifying labels intact and legible. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, that products are properly protected and undamaged and that quantities are correct.

C. Transport and handle materials and equipment in such a manner as to prevent their damage.

D. Provide workmen and equipment available to receive and unload products delivered to the site. Do not deliver or have delivered, any products to this site unless such forces are available. Employees of the Owner are directed not to accept deliveries for the Contractor.

1.7 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instruction.

1. Flammable liquids shall be stored outside the building approximately 200 feet away) in approved storage trailer.

2. Use of noxious materials: Provide Owner 24-hour prior notification of installation or application of products which emit fumes or noxious odors.

B. For exterior storage of fabricated products, place on blocking, skids or pallets above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

E. Provide substantial coverings as necessary to protect installed products from damage, from traffic and subsequent construction operation. Remove when no longer required.

1.8 PRODUCT OPTIONS

A. Submit to the Architect and Owner a complete list of the major products proposed to be used in accordance with Section 013300. Identify each product by the Specification Section and paragraph requiring product, name of manufacturer and the installing Contractor or Subcontractor.

B. Product Options:

1. Where products are specified by reference standards or by description only, select any product meeting those standards or description.

2. Where a product is specified by naming only one manufacturer due to its unique characteristics, use the product specified or submit a product substitution request on the form located in Specifications Section 012500, “Equivalency”.

3. Where products are specified by “or equal”, or by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the Specifications, or submit a product substitution request on the form located in Specifications Section 012500, “Equivalency”.

1.9 SYSTEMS DEMONSTRATION

A. Verify equipment has been inspected and put into operation and that the equipment and systems are fully operational.

B. Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

C. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed upon time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.10 TESTING, ADJUSTING AND BALANCING SYSTEMS

A. Prior to start of work, submit names of the organizations proposed to perform these services. Designate managerial responsibilities for coordination of entire testing, adjusting and balancing.

B. Fifteen days prior to Substantial Completion, submit three copies of final reports. Submit reports of testing, adjusting, and balancing which is postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1. Submit three copies of Final Report separately for each facility/building.

C. Comply with procedural standards of certifying association under whose standards service will be performed.

D. Notify Architect and Construction Manager three days prior to beginning of operations.

E. Accurately record data for each step.

F. Report to Architect any defects or deficiencies not noted during performance of services.

1.11 MATERIAL SAFETY DATA SHEETS (MSDS)

A. The Contractor shall comply with “Right to Know” requirements of Chapter 551 of Laws of New York, 1980, concerning notification of the use of toxic substances.

B. Any product or substance installed or used by the Contractor or its subcontractors which is listed in Sub-Part Z of OSHA Part 1910 Title 29 of Federal Regulations entitled “Toxic and Hazardous Substances” shall be identified to the Owner by the Contractor's submission of a standard Material Safety Data Sheet.

C. Submit a manufacturer's standard form (OSHA 20) to the Owner, with a copy to the Architect and CM, to advise of the use of such material during the period before the material is brought on site.

1. Distribute copies to each other Contractor on site and own subcontractors at site.

2. Distribute copy to the Owner's Representative, who shall keep and maintain an active file on site.

D. Each Contract: Maintain a full set of MSDS and a copy of a Hazard Communication (Right-to-Know) Book at each site.

2.0 PART 2 – PRODUCTS – (Not applicable)

3.0 PART 3 – EXECTION – (Not Applicable)

END OF SECTION 01320

SECTION 013300 – SUBMITTALS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including the General Conditions and Supplementary General Conditions and other Division 01 Specification Sections, apply to this Section.

1. The General Conditions paragraphs 3.10 and 3.11, both as amended by the Supplementary General Conditions.

2. Division 01 Section “Equivalency” for qualifications regarding equivalent products and proposed substitutions of products.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for electronic submittals required for performance of the Work, including;

1. Instructions for Accessing, Uploading, and Retrieving Submittals.

2. Contractor's Construction Schedule.

3. Submittal Schedule.

4. Shop Drawings.

5. Product Data.

6. Samples.

7. Informational Submittals.

8. Delegated Design.

9. Photographic Documentation.

10. Test Reports / Certifications.

B. Administrative Submittals: Refer to General and Supplementary Conditions, other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.

2. Applications for payment.

3. Performance and payment bonds.

4. Insurance certificates.

5. List of Subcontractors.

C. Requirements for the Schedule of Values submittal are included in General and Supplementary General Conditions.

D. Requirements for submittal of equivalent products and requests for substitution are included in Division 01 Section “Equivalency.”

E. Submittal of Record Documents and Maintenance Manuals is included under Division 01 Section "Project Closeout".

1.3 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing can be accomplished in a timely manner and will not be delayed by the need to review submittals concurrently for coordination.

a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow two weeks for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow one week for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow one week for initial review of each submittal.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow two weeks for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4" x 14" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and review stamps of the Architect and/or Consulting Engineers.

2. Include the following information on the label for processing and recording action taken.

a. Project name.

b. Date.

c. Name and address of Architect.

d. Name and address of Owner's Representative.

e. Name and address of Contractor.

f. Name and address of subcontractor.

g. Name and address of supplier.

h. Name of manufacturer.

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

3. The Shop Drawing Approval Stamp of the Prime Contractor shall read as follows:

"NOTE:
By submitting these shop drawings I represent that I approve and have determined and verified all field measurements and quantities, field construction criteria, materials, catalog numbers and similar data, and that I have reviewed and coordinated the information in the shop drawings with requirements of the work and the Contract Documents.

Spec Section _____ **_____**
(Prime Contractor's Signature)"

4. Submittals forwarded to the Architect or their consultants without the above-signed Contractor's approval stamp will be returned to the Contractor without any action by the Architect (or their consultants).

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. Subcontractors shall submit shop drawings, product data, and samples through the Contractor.

1. On the transmittal, record relevant information including Project, Prime Contractor, Subcontractor, manufacture, specification section, etc., and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.

G. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval. See Division 01 Section “Equivalency” for procedures relating to substitutions.

1.4 INSTRUCTIONS FOR ACCESSING, UPLOADING, and RETRIEVING SUBMITTALS

A. General: To avoid issues with electronic mailbox capacities, all submittals shall be uploaded to the project FTP site. This FTP site does not notify an administrator when an upload has been executed, so the Contractor shall be responsible for notifying the Architect of all uploaded submittals as indicated in the instructions below.

B. Instructions for accessing the FTP site:

a. Information associated with accessing the FTP website will be further discussed at the Pre-Construction meeting. All information, including user name and password, will be distributed to all Prime Contractors.

2. Support: Any questions or problems associated with accessing the FTP site and/or uploading/retrieving submittals, contact King + King Architects:

a. Email: **it@kingarch.com**

b. Telephone: (315) 682-6180 (Attn: IT manager)

C. Uploading Information:

1. General: The Contractor shall upload only one PDF file per submittal. Any single file containing multiple submittals will be returned to the contractor with no action taken.

a. All submittals must have a Cover Sheet that is properly completed per “Submittal Transmittal” on the Prime Contractor’s letterhead. An electronic version of the Cover Sheet, shall be available to the Contractor upon written request from the Architect.

2. The Contractor shall upload each submittal to the FTP site directly into the Contractor's Folder for "UNREVIEWED SUBMITTALS."

a. Contractor shall title the uploaded submittal with the appropriate specification section reference and a descriptive title. Limit the description title to two words. Contractor shall also state whether the submittal is a "Resubmittal."

1) EXAMPLE: 077200 "Roof Accessories"

3. **Notification: Once a submittal(s) has been successfully uploaded to the FTP site, the Contractor shall be responsible for contacting King + King Architects, in writing (via email), to notify the Architect that a submittal has been uploaded for review.**

D. Retrieving Information:

1. Once the Architect has completed the review of a submittal(s) and uploaded the information, the Contractor shall be responsible for retrieving the information directly from the Contractor's Folder for "REVIEWED SUBMITTALS."

2. **Notification: The Architect shall be responsible for contacting the Contractor in writing (via email), to notify the Contractor that a "reviewed" submittal is complete.**

a. The Contractor shall be responsible for distributing all submittals to the appropriate sub-contractors, manufacturers, vendors, etc as indicated in the "General Submittal Requirements" indicated in this section.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the conditions described in the sample release letter included at the end of this section.

B. The Contractor will be required to execute a written release in the Architect's format before the Architect's CAD files will be provided.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. A preliminary construction schedule is included in Division 01 Section - "Summary of Work". The milepost dates in this schedule are to be adhered to in order to meet the Owner's requirements for use of the facility.

B. Schedule Procedure - Under Single Prime Contracts: After the Contractor has received the "Notice-to-Proceed" from the Owner, a pre-construction meeting will be held with the Owner, Architect, Consulting Engineers, and Contractor and its superintendents who will be in charge in the field. At such meeting the procedures and scheduling of the work will be discussed.

1. For this meeting, the Contractor shall prepare an estimated preliminary construction schedule of its work, conforming to the requirements described in the Agreement, in this Section, in Division 01 Section “Summary of Work”, and as described below, indicating starting dates and estimated completion dates of each phase of the work and of the items of work or material to be installed in the project. The Contractor shall verify delivery dates, fabrication times, etc., for materials and equipment in order to develop a realistic schedule. Three copies of this preliminary schedule shall be submitted by the Contractor to the Owner’s Representative and the Architect within seven days thereafter.

2. Using the Project Schedule in Division 01 Section “Summary of Work”, and the preliminary schedule prepared by the Contractor as a guide, Subcontractors shall prepare preliminary schedules of their own Work conforming to the requirements noted in the paragraph 1 above and as described below, and interfacing their dates with the indicated dates in the Contractor's preliminary schedule. Each Subcontractor shall submit copies of its schedule to the Contractor for inclusion in a master schedule.

    a. The Contractor shall submit an electronic copy (2 copies if printed) of the proposed master schedule to the Construction Manager and the Architect within 14 days of the preliminary meeting for review and comment.

3. Once the schedule is agreed upon by the Contractor, the Construction Manager, the Architect, and the Owner, it shall be signed by the Contractor. The schedule shall be strictly adhered to until the project is completed unless it becomes necessary to revise it by an appropriate modification.

4. NO PAYMENTS WILL BE MADE ON THE CONTRACT UNTIL A MASTER SCHEDULE HAS BEEN COMPLETED AND AGREED UPON BY ALL OF THE ABOVE PARTIES.

C. Graphics for Schedule: The Contractor will prepare a fully developed, horizontal bar-chart type or critical-path type chart project construction schedule.

1. Provide a separate time-bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".

2. Prepare the schedule on a sheet, or series of sheets, on reproducible media of sufficient width to show data for the entire construction period.

3. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.

4. Coordinate the Contractors construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.

5. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for testing, training and the Architect's procedures necessary for certification of Substantial Completion.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Distribution: When the schedule has been agreed upon, print and distribute copies to the Architect, Construction Manager, Owner, subcontractors, and other parties required to comply with scheduled dates or as directed by the Architect. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

F. Schedule Updating: Revise the schedule from time to time after meetings or activities, where revisions have been recognized or made and agreed upon between the Contractor, Construction Manager, Architect, and Owner. Issue the updated schedule with report of such meeting or activity to all parties immediately after revision is made and approved by the Owner.

1.7 GENERAL SUBMITTAL REQUIREMENTS

A. PRODUCT SCHEDULE: From products listed in individual Specification Sections, Contractor shall prepare a written schedule indicating types of products required for the Work and their intended location. Include the following information in form:

1. Type of product. Include unique identifier for each product.

2. Number and name of room or space.

3. Location within room or space.

4. Number of Copies: Submit one copy of product schedule to Architect, unless otherwise indicated. Architect will return one reviewed copies.

a. The copy returned to the Contractor shall be marked and maintained as a "Record Document".

B. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 36" x 48". Should the Architect request hardcopies of submittal larger the 11” x 17”, the Contractor shall be responsible for supply the appropriate quantity of drawings.

C. Initial Submittal: Submit an electronic copy for the Architect’s review.

1. Contractor shall forward copy of transmittal *only* to Construction Manager.

2. Submittals will be uploaded to the FTP site once they have been marked by the Architect indicating action taken and corrections or modifications required.

   a. The Contractor shall maintain a copy as a "Record Document."

3. One copy will be forwarded to the Owner's Representative that has been marked by the Architect indicating action taken and corrections or modifications required.

D. Final Submittal (if requested): Submit one electronic copy for the Architect's Review. Submittals will be uploaded to the FTP site once they have been marked by the Architect indicating action taken and corrections or modifications required.

1. The Contractor shall maintain a copy as a "Record Document".

2. One copy will be forwarded to the **Owner** that has been marked by the Architect indicating action taken and corrections or modifications required.

E. Shop drawings or product data sheets which do not bear the approval stamp of the Contractor or which, in the opinion of the Architect or Architect's consultants, have only been superficially checked, are incomplete or contain numerous errors may be returned without review for resubmission by the Contractor. In such event, it will be deemed that the Contractor has not complied with this Article and he shall bear the risk of all delays to the same extent as if no drawings or details had been submitted.

F. Do not use Submittals without the Architect's appropriate final stamp indicating action taken in connection with construction.

G. Distribution: Contractor shall be responsible for furnishing copies of final submittals to installers, subcontractors, suppliers, manufacturers, fabricators, other Contractors and others required for performance of construction activities. Show distribution on transmittal forms.

1. Do not proceed with installation until a copy of applicable Submittal is in the installer's possession.

2. Do not permit use of unmarked copies of a Submittal in connection with construction that do not bear both the approval stamp of the Contractor and the Architect's stamp indicating their review action.

1.8 SHOP DRAWINGS

A. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions and thicknesses.

2. Identification of products and materials included.

3. Compliance with specified standards.

4. Notation of coordination requirements and relation to adjoining work. The Contractor shall note specifically which subcontractor is to perform adjacent work, rather than the general notation "by others".

5. Notation of dimensions established by field measurement.

6. Methods of assembly and attachment and indication of adjacent construction being attached to.

7. Other pertinent data and information.

C. If any change in other adjacent parts of the construction would be created or required by a shop drawing proposal, such change must be called to the Architect's attention and his review obtained for such change before any work is fabricated or started.

D. Shop drawings which do not bear the approval stamp of the Contractor or which in the opinion of the Architect or Consulting Engineers are incomplete, contain numerous errors or have only been checked superficially may be returned without review for resubmission by the Contractor. In such event, it will be deemed that the Contractor has not complied with this Article and he shall bear the risk of all delays to the same extent as if no drawings or details had been submitted.

1. One of the copies returned shall be marked and maintained as a "Record Document."

E. Do not use Shop Drawings without the Architect’s appropriate final stamp indicating action taken in connection with construction.

F. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Preparation of coordination Drawings may be specified in Division 01”Summary of Work”; and Divisions 21, 22, 23 and 26 "Basic Mechanical and Electrical Requirements" and may include components previously shown in detail on Shop Drawings or Product Data.

2. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.9 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be

specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

   a. Manufacturer's printed recommendations.

   b. Compliance with recognized trade association standards.

   c. Compliance with recognized testing agency standards.

   d. Application of testing agency labels and seals.

   e. Notation of dimensions verified by field measurement.

   f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

B. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

1. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.

2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.10 SAMPLES

A. Submit actual Samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

1. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

2. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.

3. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.

4. Samples not incorporated into the work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

B. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit two full sets of choices for the material or product.

1. Preliminary submittals will be reviewed and one copy returned with the Architect's mark indicating selection and other action. One copy will be retained by the Architect.

C. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit one set; one will be returned marked with the action taken.

D. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

E. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

F. Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.

1. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

G. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Project Close-Out."

H. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

I. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.

2. Required substrate tolerances.

3. Sequence of installation or erection.

4. Required installation tolerances.

5. Required adjustments.

6. Recommendations for cleaning and protection.

1.11 INFORMATIONAL SUBMITTALS

A. Informational Submittals are written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

B. Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit four copies of each submittal, unless otherwise indicated. Architect will return two copies.

2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

C. Inspection and Test Reports: The independent testing agency shall submit directly to the Architect, with a copy to both the Contractor and the Owner's Representative, a certified written report, in duplicate, of each inspection, test, or similar service. If the Contractor is not responsible for the testing service, the independent testing agency shall submit their report directly to the Architect with a copy sent directly to the Owner's Representative and the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.

b. Project title and number.

c. Name, address, and telephone number of testing agency.

d. Dates and locations of samples and tests or inspections.

e. Names of individuals making the inspection or test.

f. Designation of the Work and test method.

g. Identification of product and Specification Section.

h. Complete inspection or test data.

i. Test results and an interpretation of test results.

j. Ambient conditions at the time of sample taking and testing.

k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.

l. Name and signature of laboratory inspector.

m. Recommendations on retesting.

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.

2. Date of evaluation.

3. Time period when report is in effect.

4. Product and manufacturers' names.

5. Description of product.

6. Test procedures and results.

7. Limitations of use.

K. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Project Close-Out."

L. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

M. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.

2. Required substrate tolerances.

3. Sequence of installation or erection.

4. Required installation tolerances.

5. Required adjustments.

6. Recommendations for cleaning and protection.

N. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.

3. Statement that products at Project site comply with requirements.

4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.

6. Statement whether conditions, products, and installation will affect warranty.

7. Other required items indicated in individual Specification Sections.

O. Material Safety Data Sheets (MSDSs): Submit information directly to Owner’s Representative, Architect, and Owner; do not submit to Architect. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

1.12 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit four copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional. Include the following as a part of the design professional's certification:

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents and as required by governing building code(s).

2. List codes, loads, and other factors used in performing these services.

2.0 PART 2 – PRODUCTS

2.1 ASBESTOS

A. It is the intent of the Architect that all materials used or installed in the construction of this project contain no (zero percent) asbestos of any kind or amount. It is the responsibility of each Prime Contractor to request from his subcontractors, suppliers, fabricators, etc. certificates indicating that all materials used or installed in the construction of this project contain no (zero percent) asbestos of any kind or amount. Provide such certificates to the architect if so requested.

2.2 OTHER HAZARDOUS OR TOXIC MATERIALS

A. Whenever the specifications state that a product shall contain a limited amount of a hazardous or toxic material (i.e. formaldehyde, lead, benzene, mercury, PCB's, VOC's etc.) the Prime Contractor for whose work it applies shall provide certificates from the product's manufacturers indicating that those products used or installed in the construction of this project contain no more than the limits specified of such hazardous or toxic materials.

3.0 PART 3 – EXECUTION

3.1 ARCHITECT'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Architect and/or Consulting Engineer will stamp each submittal with a uniform action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. "**A ACTION**": The Contractor is advised that "A ACTION" means that the submission is in general conformance with the design concept and Contract Documents and **No Exceptions Taken**.

2. "**B ACTION**": The Contractor is advised that "B ACTION" means that the submission is in general conformance with the design concept and Contract Documents and as noted. **Revise As Indicated, No Resubmittal Required**.

3. "**C ACTION**": The Contractor is advised that "C ACTION" means that the Contractor shall **Revise As Indicate and Resubmit**. Any submission marked "C ACTION" shall not be permitted on the site.

4. "**D ACTION**": The Contractor is advised that "D ACTION" means that the submission is **Rejected** for nonconformance with the design concept and Contract Documents and that the Contractor shall make a **new submittal**. Any submission marked "D ACTION" shall not be permitted on the site.

5. "**E ACTION**": The Contractor is advised that "E ACTION" means that the Contractor shall **submit one or more samples, or additional information is required** as noted on the Shop Drawings.

C. **OTHER ACTION**: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

END OF SECTION 013300

CAD Release Form

CAD Plan Files Disclaimer, Release and Limitation of Liability Agreement

King + King Architects, LLP
358 West Jefferson Street
Syracuse, NY 13202

Project No.: XX-XX-XXXX
Project Name:
Date: XX/XX/XXXX

The information contained within the electronic files, for the above listed project, was created by King + King Architects, LLP. While King + King Architects, LLP has made appropriate efforts to provide accurate digital plan documents, it cannot guarantee that these documents contain complete and accurate information. These documents must be compared to the original hard copy documents, with stamped and sealed certification, in order to ensure the accuracy of the information contained and to further ensure that no changes or modifications have been made to the digital documents.

All design files are converted AutoCAD XXXX drawing files (*.dwg). Receiver agrees that King + King Architects, LLP was asked to provide the files in this format and agrees to accept the files in the format provided. Receiver agrees that King + King Architects, LLP cannot be held responsible for problems arising from files which have been converted for use in non-native applications (e.g., VectorWorks files to AutoCAD design files).

Since revisions or additions to the design file(s) may occur at any time, the receiver agrees to indemnify, defend and hold harmless King + King Architects, LLP, its officers, agents, and employees from and against any and all claims, suits, losses, damages or costs, including reasonable attorney's fees, arising from the use of outdated design files, and such indemnification shall survive acceptance of said file(s) by receiver.

Any use of these documents is at the receiver's sole risk. The undersigned agrees, to the fullest extent permitted by law, to indemnify and hold harmless King + King Architects, LLP, its officers, directors, employees and subconsultants against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising from any changes made by anyone other than King + King Architects, LLP or from any use, transfer or reuse of the electronic files.

Under no circumstances shall delivery of electronic files for use by the undersigned be deemed a sale by King + King Architects, LLP, and King + King Architects, LLP makes no warranties, either express or implied, of merchantability and fitness of these files for any particular purpose. In no event shall King + King Architects, LLP be liable for indirect or consequential damages as a result of the use or reuse of the electronic files.

Upon execution of this agreement King + King Architects, LLP will furnish electronic files of the following drawing sheets:

(fill in drawing #'s): _____

AGREED

I have read, understand and agree to this Disclaimer/Release/Limitation of Liability, and I am authorized by the receiver named below to execute this agreement on its behalf.

Company (Receiver): _____

By Name: _____ Title: _____

Signature: _____ Date: _____

SECTION 013400 – CONSTRUCTION PROGRESS SCHEDULE AND SUBMITTALS

PART 1 - GENERAL

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for schedules and reports required for proper performance of the Work, including:

Construction schedule.
Submittal schedule.
Use of site plan.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures for submittal of the Schedule of Values.

2. Division 1 Section "Submittal Procedures" for submitting schedules and reports.

3. Section 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

4. Division 1 Section "Closeout Procedures for submitting Project Record Documents at project closeout.

5. Division 1 Section “Summary of Work” for Milestone Completion Dates, Substantial Completion and Final Completion.

C. Each Contractor shall provide a CPM Construction Schedule that assists the Construction Manager in managing the timely completion of work.

D. Each Prime Contractor’s schedule shall be generated and maintained in Critical Path format utilizing Microsoft Project 2003 or a scheduling program that is compatible with Microsoft Project 2003.

E. Float is a resource available to the Owner and Construction Manager only.

F. Each Contractor shall prepare a Construction Schedule to:

1. Assure adequate Contractor planning, procurement, and execution of the Work of all trades so that the Work will be completed within the time allotted by the Contract. The General Contractor, under direction of the Construction Manager, shall prepare and maintain a construction schedule from input provided by contractors, based on a network analysis system using the Critical Path Method (CPM).

2. Anticipate adequate time for all construction and construction related activities. These activities include but are not limited to the following permit approvals, shop drawing submittals, coordination drawing preparation, weather, shipping times, code inspections, utility work, utility connections, punch listing and correction of the Work, Architect, Mechanical, Electrical and Code Official review of the Work, and an expeditious closeout. Work activities of all Prime Contractors and all subcontractors by trade shall be represented on the schedule. The Contractor shall insure staffing, hours worked, and materials are furnished in adequate quantities and at appropriate intervals to insure timely completion of the Work.

3. Obtain input from all other Prime Contractors and subcontractors regarding their portion of the Work, obtain manning requirements, work durations, materials and equipment delivery lead times, delivery time and installation times.

G. Intent: The intent of the Construction Schedule requirement for this Work is:

1. To provide for a logical sequencing of the Work with adequate time allotted for all trades to complete their portion of the Work, so that the entire Project is completed within the time allotted by the Contract.

2. To provide a logical sequence for ordering and procuring materials for incorporation into the Work, so that the entire Project is completed within the time allotted by the Contract.

3. To prevent interruptions in the flow of the Work.

H. Schedule Format:

1. Tabular Activity Listing: Listing shall be in chronological order according to the early start date for each activity.

2. CPM Bar Chart Sheet Size: 36” x 48”. Tabular Activity Listing format is 8-1/2” x 11” sheets bound in three-ring loose-leaf binders.

3. Scale and Spacing: To allow for notations and revisions.

4. The activities shown on schedule are to include:

a. Building Area
b. Description of the Work.
c. Duration in workdays.

1.03 GUIDELINE SCHEDULE

A. A guideline/milestone schedule is enclosed hereinafter showing Milestone Activities for the Project, as well as anticipated completion date.

1. The guideline schedule is to be used for bidding purposes only; however, the indicated milestone dates and overall completion dates of the Project must be accomplished in a coordinated fashion by all Contractors. Inability to complete its work in a timely coordinated fashion will subject the responsible Contractor to applicable damages including extended Construction Manager and Architect costs, resultant Owner direct and indirect costs, etc.

2. Attached at the end of this section is a schedule of milestones, which are considered contract requirements.

3. Timely completion of this project (including but not limited to project milestones) is of critical importance to the Owner.

1.04 CONSTRUCTION SCHEDULES

A. Within ten (10) days after receipt of a Contract Award, each Contractor is to assemble all necessary information and dates concerning his activities and those of his Subcontractors and Suppliers and submit such information in a format required by applicable por-

tions of this section. Each Contractor shall submit the following schedule information to the Construction Manager as a minimum:

1. A list of all activities contained in the Contractor's Scope of Work. This list shall include activity descriptions and durations for all activities in workdays (as opposed to calendar day) for shop drawings, fabrication, delivery and installation of products, materials, and equipment. The activities on the schedule must be at a level of detail approved by the Construction Manager and agree with the terminology and building sequencing established by the Construction Manager.

2. Identification of precedent relationships between the Contractor's activities and those of other Contractors based on a thorough review of the Contract Drawings and details showing interface between Contracts.

3. Graphic diagrams indicating the proposed direction of work whenever applicable or if requested by the Construction Manager.

4. Shortly after receipt of this information the Construction Manager shall convene the Schedule Compilation Meetings referenced in hereafter.

B. In collaboration with the various Contractors associated with the Work, the General Contractor, under direction of the Construction Manager, will compile all Contractor information and develop a Project Master Construction Schedule, which integrates activities of Architect, Construction Manager, Contractors, Subcontractors, and Suppliers and meets the time requirements. The sequence of all work activities shall be determined by the Construction Manager and the General Contractor and shall be reviewed by all Contractors. This schedule will become the project plan for construction.

C. Each Contractor will attend meetings (as required) with the Construction Manager to review and coordinate all work activities to finalize the Master Baseline Construction Schedule which will be issued to each Contractor as a no cost change order. A Master Baseline Construction Schedule acceptable to all Contractors must be completed prior to processing of Progress Payment No. 2 to any contractor. All contractors must dedicate personnel necessary to provide information, attend meetings, and cooperate as necessary to that end. Award status of purchase orders, subcontracts, etc. will not be an acceptable reason for delay of schedule information.

D. Contractors' schedule activities may be re-sequenced and the schedule adjusted provided all Work is completed within the stated milestone dates and if the Construction Manager and affected Contractors are notified of the change within 5 calendar days of receipt of the schedule; otherwise, the Project Master Construction Schedule shall be deemed accepted by all parties and becomes a contractual requirement for each Contractor.

E. The Master Baseline Construction Schedule developed will be consistent with the guideline schedule and utilize the Contractors' input as much as possible.

1. Contractor's shall provide the Construction Manager with information and data to prepare a working day construction schedule and sequence of events for each work activity included in his bid category within seven days after the Preconstruction Meeting. The Contractor shall cooperate with the Construction Manager in establishing a final overall project schedule, which meets the specified milestones and completion date.

2. Once approved by the Construction Manager, the schedules from the other prime Contractors will be forwarded to the General Contractor. The General Contractor

will create a Final Master Schedule.

3. After the Project Schedule has been established, the Contractors shall work overtime, nights and weekends, if necessary, to maintain their portions of the schedule. Time is of the essence.
   a. Overtime, night and weekend work will be at no additional cost to the Owner.
   b. Failure of any Contractor to maintain his portion of the schedule will be grounds for the Owner to withhold all or part of any payments, which may become due the Contractor.

4. The Contractor is responsible to expedite all approvals and deliveries of material so as not to delay job progress. The Contractor shall coordinate the release and shipping of materials and equipment with suppliers in conjunction with the guideline/milestone schedule. Costs associated with partial shipments and expeditious deliveries shall be anticipated and included as part of the base bid.

5. The Contractor shall begin all phases of his work as quickly as physically possible, but not to impede or jeopardize the work of other Contractors.

6. Phases of the work may be started prior to the scheduled start dates if coordinated with other Contractors, and, if approved through the Construction Manager.
7. The Contractor shall cooperate fully with the Construction Manager in the coordination of the work with all other Contractors and the convenience of the Owner as indicated in The Specifications.

F. Each Contractor's work shall be executed at such a rate as to ensure meeting the specified milestone and dates for Substantial Completion. By execution of the Contract, a Contractor represents he has analyzed the Work, the materials and methods involved, the systems of the building, availability of qualified mechanics and skilled labor, restrictions of the site, constraints imposed, his own work load and capacity to perform the Work and agrees that the specified dates are reasonable considering the existing conditions prevailing in the locality of the Work, including weather conditions, and other factors with reasonable allowance for variations from average or ideal conditions.

G. The Construction Manager will utilize the Master Baseline Construction Schedule to plan, coordinate, and monitor all construction activities of Contractors, Subcontractors, and Suppliers. All Contractors are to complete all Work in accordance with this schedule.

H. The Construction Manager will hold periodic progress meetings at the job site. Field supervisors from each Contractor working on the site are to attend all such meetings. Each Contractor is to provide services of responsible personnel to provide necessary scheduling and manpower information. Each Contractor shall be responsible to be familiar with the schedule, how it will affect or modify his operations including his coordination with the activities of other Contractors. Each Contractor shall prepare a short interval schedule generally covering a 2-week period to coordinate the detailed activities of subcontractors and suppliers, and the work of other Prime Contractors. The short interval schedules shall be prepared in bar chart form and be submitted 24 hours prior to the job progress meetings, or as required by the Construction Manager. The General Contractor, under direction of the Construction Manager, will update the project master construction schedule, display the current schedule at the job site and prepare progress reports accordingly.

I. Whenever it becomes apparent that any activity completion date may not be met, the responsible Contractor(s) are to take some or all of the following actions at no additional cost to the Owner or Construction Manager.

1. Increase construction manpower to put the project back on schedule.

2. Increase number of working hours per shift, shifts per working day, working days per week, amount of construction equipment, or any combination, which will place the project back on schedule.

J. If the Contractor fails to take any of the above actions, Owner or Construction Manager may take action to attempt to put the project back on schedule and deduct cost of such actions from monies due or to become due the Contractor in accordance with Section 2.4 of the General Conditions as modified by the Supplemental Conditions of the Contract.

K. The Construction Manager will monitor the project. The Contractor shall make every effort to complete the project within the schedule. Time extensions may be granted to various Contractors when delays that affect final completion date have been caused by inability of another Contractor(s) to meet his time commitments; however, neither Owner nor Construction Manager will assume responsibility to any Contractor for compensation damages, or other costs due to delays.

1.05 RECOVERY SCHEDULES

A. Recovery Schedule: A recovery schedule shall be prepared by each Prime Contractor with input from all trades to accelerate progress, if a milestone is missed, a single duration work activity is incomplete for ten (10) work days, or overall work progress is deemed insufficient by the Construction Manager.

1. Upon notification a recovery schedule shall be initiated by the Prime Contractor at fault, revisions shall be received in three working days from the Prime Contractors / subcontractors and a new recovery schedule submitted ten (10) working days after one of the above conditions occur.

2. Recovery Schedule: Submit revised diagram and Tabular Activity Listing approved by all Prime Contractors / subcontractors (submitting same number of copies as original schedule).

3. Each Prime Contractor is to provide a two (2) week look ahead schedule every Monday morning. Include work performed during the previous week.

4. Prime Contractor at fault shall add staff and/or work overtime as necessary to bring the Project back on schedule using the recovery schedule. Accelerated Work and additional overhead necessary to keep the Project on schedule is included in the Contract. Prime Contractor at fault will be responsible for all costs from other Prime Contractors to maintain the recovery schedule.

1.06 SCHEDULE COMPILATION MEETINGS

A. The purpose of this series of meetings is to compile a detailed Master Schedule in compliance requirements set forth by the Contract Documents in a timely fashion.

B. Advanced notice of the Schedule Compilation Meeting dates, time, and place will be sent to the Prime Contractors by the Construction Manager. The Schedule Compilation Meetings shall commence shortly after issuance of the Contract Award to the Prime Contracts and be held as needed until a schedule acceptable to the Construction Manager is completed.

C. The schedule diagram shall show a statement that all Prime Contractors have participated in the preparation of the schedule and reviewed this final printing and that each signature indicates approval thereof.

D. Master Construction Schedule shall be issued to each Prime Contractor as a no cost change order.

E. The Master Schedule must be compiled and agreed upon by each Prime Contractor before the second Application for Payment from each contractor can be processed.

F. Each Prime Contractor shall be required to attend each of the Schedule Compilation Meetings without fail. Failure to cooperate in the scheduling process may be considered Breech of Contract subject to the Terms and Conditions of the Contract.

G. Each Prime Contractor must address all work within their scope regardless of the status of award of lower tier subcontracts or purchase orders. Inability to involve such lower tier subcontractors and/or suppliers is not acceptable reason to delay cooperation in the assembly of the schedule or to defer providing required information. Each Prime Contractor or Supplier may involve lower tier subcontractors or Suppliers in the Schedule Compilation Meetings at their option.

H. The timing of these meetings cannot be altered to meet the needs of any individual Prime Contractor. Each must dedicate resources to attend the meetings as they are scheduled by the Construction Manager until the scheduling process is completed.

I. Neither the acceptance, review, nor approval of the Contractor's schedule or other data submitted by the Contractor pursuant to this section, nor any other action on the part of the Construction manager under this section, shall in any way be deemed as a representation by the Owner that the Contractor can or will be permitted to follow a particular schedule or sequence, he can or will complete the work by the time(s) required by the Contract or by any other time(s). Nor shall the approval of the contractually required Work by the time(s) required in the Contract, even though such schedule approved may be inconsistent with such completion.

J. Any approval under this section shall be construed merely to mean that the Construction Manager knew of no good reason at that time to object thereto. Review or approval or any other action under this section shall limit, affect or impair the Contractor's obligation to perform all Work by time(s) required by the Contract and in accordance with all other provisions of the Contract.

1.07 SUBMITTAL SCHEDULE

A. ALL submittals are to be received and approved within two (2) months of contract award in accordance with a detailed Schedule of Submittals approved by the Construction Manager. If this is not achieved, then there will be a $100.00 per day Deduct Change Order written.

1. It is the responsibility of the Contractor to understand the lead time associated with each of their submittals and how this lead time impacts their work according to the schedule.
2. It is the Contractors responsibility to notify the Construction Manager of expected long lead times. Any submittals that have the possibility to delay the project should be submitted first.
3. If it is determined by the Construction Manager that the project is delayed due to the submission of a submittal, the Owner or Construction Manager may take action to at-

tempt to put the project back on schedule and deduct cost of such actions from monies due or to become due the Contractor in accordance with Section 2.4 of the General Conditions as modified by the Supplemental Conditions of the Contract.

B. Each Prime Contractor shall prepare a complete a Schedule of Submittals. Submit the Schedule of Submittals within twenty (20) days of the Notice of Award.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Construction Schedule.

2. Prepare the schedule in chronological order. Provide the following information:
   a. Scheduled date for the first submittal.
   b. Related Section number.
   c. Submittal category (Shop Drawings, Product Data, or Samples).
   d. Name of the Subcontractor.
   e. Description of the part of the Work covered.
   f. Scheduled date for resubmittal.
   g. Scheduled date for the Architect's final release or approval.

C. Distribution: Following response to the initial submittal schedule, print and distribute copies to the Construction Manager, Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Any revisions to the Submittal Schedule must be approved by the Construction Manager. In no case will the submittal period be extended past the four (4) month limit unless an approved supplier ceases business.

D. It shall be the responsibility of each Prime Contractor to submit to the Construction manager and "Equipment/Long Lead Item Procurement Report" two (2) weeks after receipt of Notice of Award. The Contractor shall list all equipment and other long lead items that are being purchased, drawing submittals, samples, etc., for a complete composite report. The report shall be resubmitted to the Construction Manager with updated information weekly until such time as Construction Manager notifies the Contractor that only bi-monthly or monthly reports are required.

PART 2 - PRODUCTS

2.1 CONSTRUCTION SCHEDULE

A. The General Contractor shall convert the Master Base Line Schedule to PDF format for distribution.

PART 3 - EXECUTION

3.1 SCHEDULE PREPARATION

A. Graphically show all activities necessary to complete the Work, and the sequence in which each such activity is planned to be accomplished, as planned by the Prime Contractor and the project field superintendent. This shall be done coordinating data with all Prime Contractors and is necessary to complete the Project which shall be shown on the diagram.

B. Preliminary schedule shall be a Preliminary Bar Chart Diagram.

C. Content: Include, but do not necessarily limit indicated activities as follows:

1. Project mobilization.

2. Identify work of separate stages, separate floors, and other logically grouped activities. Submittal and review of Shop Drawings. (Prime Contractor shall include adequate basic time for the review and approval of all submittals and additional time in schedule for their review). Indicate dates reviewed submittals are needed back from the A/E. The Construction Manager shall coordinate durations necessary for submittal review with the A/E prior to completion of the schedule.

3. Procurement of equipment and material.

4. Site work, site utilities, footings, structural steel, decking, walls, dry-in (roof and glazing), rough-ins, building utilities, finishes, systems and equipment installation.

5. Fabrication of special equipment and material, its installation and testing.

6. Partial occupancy of site areas and building spaces by Owner during construction.

7. Final cleanup.

8. Building System Equipment commissioning (start-up) and testing.

9. Punch list and corrective activities.

10. Substantial Completion.

11. Project Completion.

D. Show information in such detail that duration times of activities (only one trade per activity) will range normally from one (1) to fifteen (15) calendar days, maximum. The selection and number of activities shall be adjusted as necessary.

E. Show on the chart, as a minimum for each activity, preceding and following event numbers, and description of each activity, and activity duration in calendar days.

F. The Prime Contractor or their subcontractor actually to perform work.

G. Legend shall identify all graphics on diagrams.

3.2 NETWORK ANALYSIS

A. Prepare network analysis and supporting mathematical analysis using the Critical Path Method (CPM).

B. Logic shall organize and schedule shall graphically illustrate order and interdependence of activities and sequence of Work; how start of a given activity depends on completion of preceding activities; and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using work dates, and identify for each activity;
   1. Preceding and following event numbers.
   2. Activity ID and description with corresponding specification section number.
   3. Estimated duration of activity, in maximum fifteen (15) day intervals.

4. Remaining duration in days.
5. Earliest start date.
6. Earliest finish date.
7. Accumulated percentage completion of each item and total percent of the Work completed as of the first day of each month.
8. Total add free float; float time shall accrue to the Owner and to the Owner's benefit.

D. Recovery Schedule: Provide the following additional information should the Project fall behind schedule, coordination and cooperation amongst the trades become lacking all as deemed by the Construction Manager.
1. Actual start date.
2. Actual finish date.
3. Latest start date.
4. Latest finish date.
5. Sub-schedules to define critical portions of the entire schedule.

E. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

F. Change Orders: Approved change orders include workers, materials and work hours necessary for the Project to remain on schedule.

G. Required Reports: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
2. By amount of float, then in order of early start.
3. By responsibility in order of earliest possible start date.
4. In order of latest allowable start dates.
5. In order of latest allowable finish dates.
6. Contractor's periodic payment request sorted by Schedule of Values listings or specifications sections as determined by the A/E.
7. Listing of basic input data which generates the report.
8. Listing of activities on the critical path.

3.3 SCHEDULE MAINTENANCE

A. Each Prime Contractor shall revise their activities as necessary to keep the Project on schedule.

B. Each Prime Contractor shall participate in the Construction Manager's review and evaluation of the schedule prior to each monthly (or recovery effort) schedule update submittal.

C. Each Prime Contractor shall evaluate project status daily to determine each work activity that is behind schedule and work activities that are ahead of schedule.

D. Each prime Contractor shall maintain a record of these evaluations and submit them to the Construction Manager upon request.

3.4 UPDATING SCHEDULE

A. Each Prime Contractor maintains schedules to record actual start and finish dates of completed activities monthly.

B. Each schedule update shall indicate the construction progress of each activity up to the date of the schedule revision, and include the projected completion date of each activity.

C. Update bar charts to graphically depict current status of Work.

D. Each Prime Contractor shall identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain date of Substantial Completion.

F. Submit reports required to support recommended changes monthly or as deemed necessary by Construction Manager.

G. Each Prime Contractor shall provide a narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect (including the effects of changes on schedules of separate contractors).

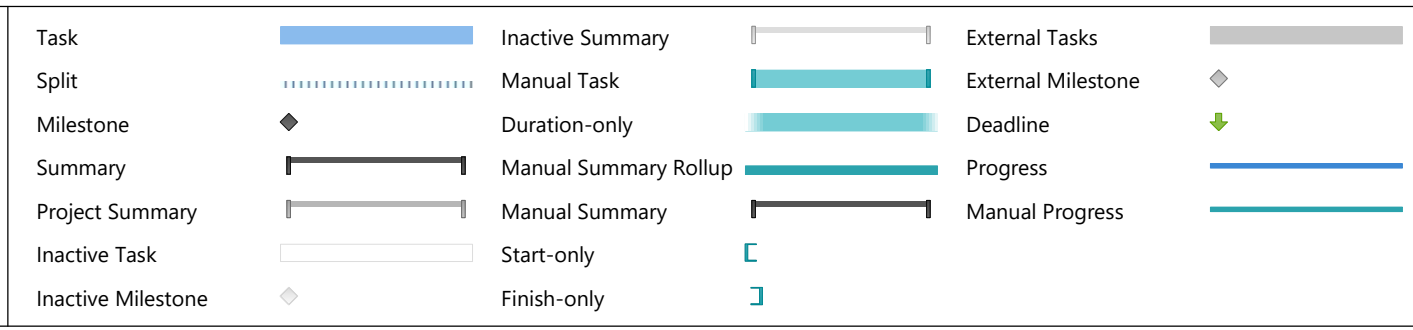
3.5 DISTRIBUTION OF SCHEDULE

A. Construction Manager shall distribute copies of (updated) schedule to Owner, Architect and Prime Contractors who shall be responsible for distributing copies to subcontractors and suppliers with a “need to know”,

B. Each Prime Contractor is to promptly report to Construction Manager in writing, problems anticipated by projections shown in schedules.

END OF SECTION 011100

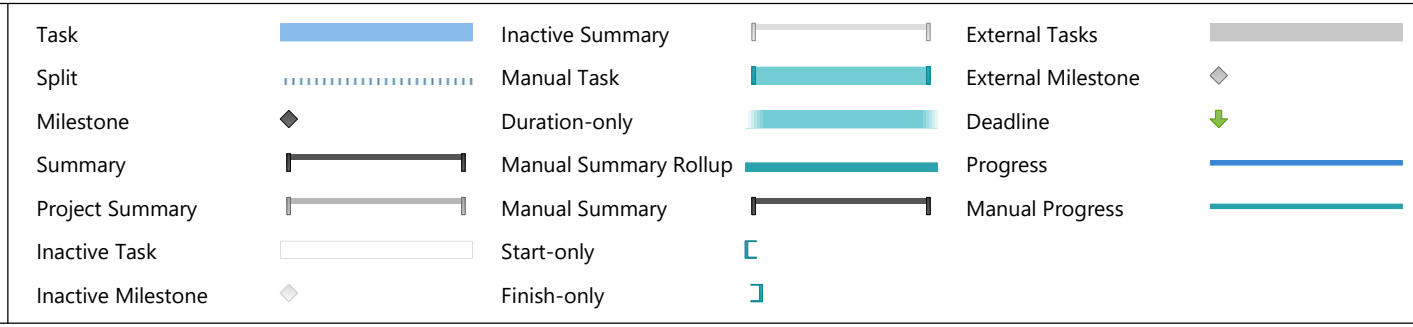
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		**NSCSD SAFETY & SECURITY**	750 days	Mon 11/10/25	Fri 9/22/28		
2		**HIGH SCHOOL**	220 days	Mon 11/10/25	Fri 9/11/26		
3		Demo and install fencing area A and B	20 days	Mon 6/1/26	Fri 6/26/26		
4		Exterior window signage	3 days	Mon 11/24/25	Wed 11/26/25		
5		Demo and replace stair treads	25 days	Mon 11/10/25	Fri 12/12/25		
6		Demo secure vestibule	5 days	Mon 7/6/26	Fri 7/10/26		
7		Construct secure vwstibule	15 days	Mon 7/13/26	Fri 7/31/26		
8		Install new cabling/devices parallel to existing	160 days	Mon 11/17/25	Fri 6/26/26		
9		Equipment connections	25 days	Mon 7/6/26	Fri 8/7/26		
10		Electrical for security	40 days	Mon 7/6/26	Fri 8/28/26		
11		Demo/Install storefront	5 days	Mon 7/6/26	Fri 7/10/26		
12		Demo/Install Curtain Walls	85 days	Mon 5/18/26	Fri 9/11/26		
13		Pool Area wall tile	30 days	Mon 6/1/26	Fri 7/10/26		
14		Install bleachers at pool area	20 days	Mon 7/13/26	Fri 8/7/26		
15		Fire alarm/security cutover to new	5 days	Mon 8/10/26	Fri 8/14/26		
16		Punchlist	15 days	Mon 8/24/26	Fri 9/11/26		
17		**ALLEN ROAD**	55 days	Mon 12/22/25	Fri 3/6/26		



Project: Safety and Security Sch
Date: Mon 8/18/25

Task
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Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
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Deadline
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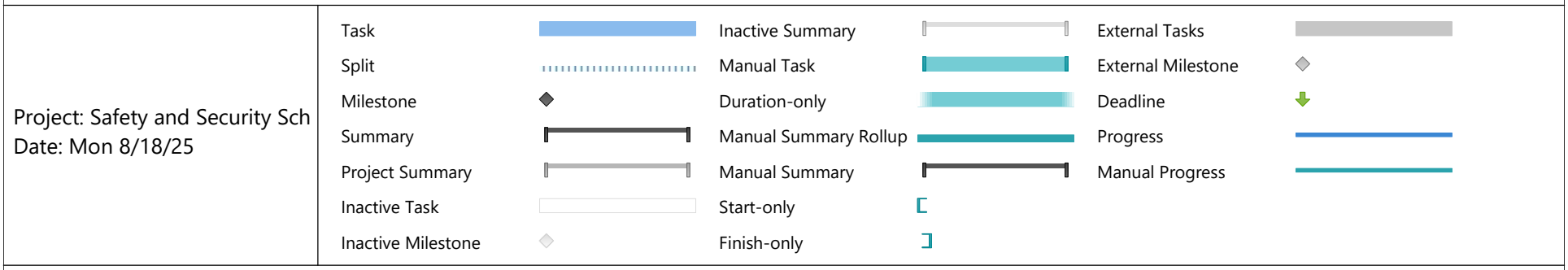
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
18		Demo	5 days	Mon 12/22/25	Fri 12/26/25		
19		Install security window and package reciever	2 days	Mon 12/29/25	Tue 12/30/25		
20		Security Film	1 day	Wed 12/31/25	Wed 12/31/25		
21		Framing	2 days	Thu 1/1/26	Fri 1/2/26		
22		Gyp and Finish	4 days	Mon 1/5/26	Thu 1/8/26		
23		Paint	1 day	Fri 1/9/26	Fri 1/9/26		
24		Ceilings	2 days	Mon 1/12/26	Tue 1/13/26		
25		Install Fire and Security System	40 days	Mon 12/22/25	Fri 2/13/26		
26		Demo Fire and Security System	15 days	Mon 2/16/26	Fri 3/6/26		
27		Fence removal/Replacement	20 days	Mon 3/9/26	Fri 4/3/26		
28		**SMITH ROAD**	85 days	Mon 3/2/26	Fri 6/26/26		
29		Install cameras	65 days	Mon 3/2/26	Fri 5/29/26		
30		Vestibule demo	5 days	Mon 4/13/26	Fri 4/17/26		
31		Build temp partition	2 days	Thu 4/16/26	Fri 4/17/26		
32		Frame and Gyp. Walls	5 days	Mon 4/20/26	Fri 4/24/26		
33		Paint	1 day	Mon 4/27/26	Mon 4/27/26		
34		Install shutter	2 days	Tue 4/28/26	Wed 4/29/26		
35		Install flooring	2 days	Thu 4/30/26	Fri 5/1/26		
36		Install casework/countertop	5 days	Mon 5/4/26	Fri 5/8/26		



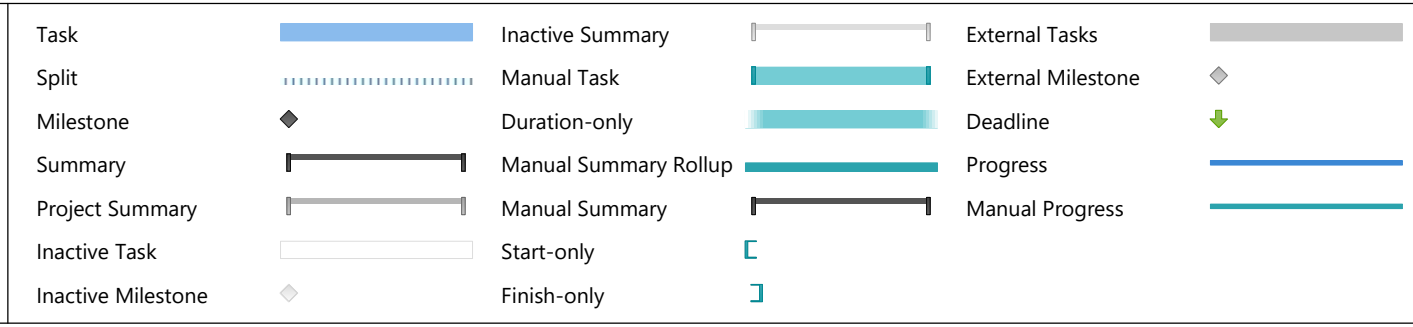
Project: Safety and Security Sch
Date: Mon 8/18/25

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Manual Summary
Start-only
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External Tasks
External Milestone
Deadline
Progress
Manual Progress

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
37		Final Clean	1 day	Mon 5/11/26	Mon 5/11/26		
38		Punchlist	4 days	Tue 5/12/26	Fri 5/15/26		
39		Secuirty film	30 days	Mon 5/18/26	Fri 6/26/26		
40		Way Finding	15 days	Mon 6/8/26	Fri 6/26/26		
41		**DISTRICT OFFICE**	20 days	Mon 12/21/26	Fri 1/15/27		
42		Demo	5 days	Mon 12/21/26	Fri 12/25/26		
43		Install security window and package reciever	2 days	Mon 12/28/26	Tue 12/29/26		
44		Security Film	1 day	Wed 12/30/26	Wed 12/30/26		
45		Framing	2 days	Thu 12/31/26	Fri 1/1/27		
46		Gyp and Finish	4 days	Mon 1/4/27	Thu 1/7/27		
47		Paint	1 day	Fri 1/8/27	Fri 1/8/27		
48		Ceilings	2 days	Mon 1/11/27	Tue 1/12/27		
49		Install Fire and Security System	40 days	Mon 12/21/26	Fri 2/12/27		
50		Demo Fire and Security System	15 days	Mon 2/15/27	Fri 3/5/27		
51		**JUNIOR HIGH SCHOOL**	180 days	Mon 6/29/26	Fri 3/5/27		
52		Remove/Install Fencing	45 days	Mon 6/29/26	Fri 8/28/26		
53		**Vestibule C1**					
54		Demo	5 days	Mon 7/6/26	Fri 7/10/26		
55		Frame and finish	4 days	Mon 7/13/26	Thu 7/16/26		
56		Install Storefronts and HM door	11 days	Fri 7/17/26	Fri 7/31/26		



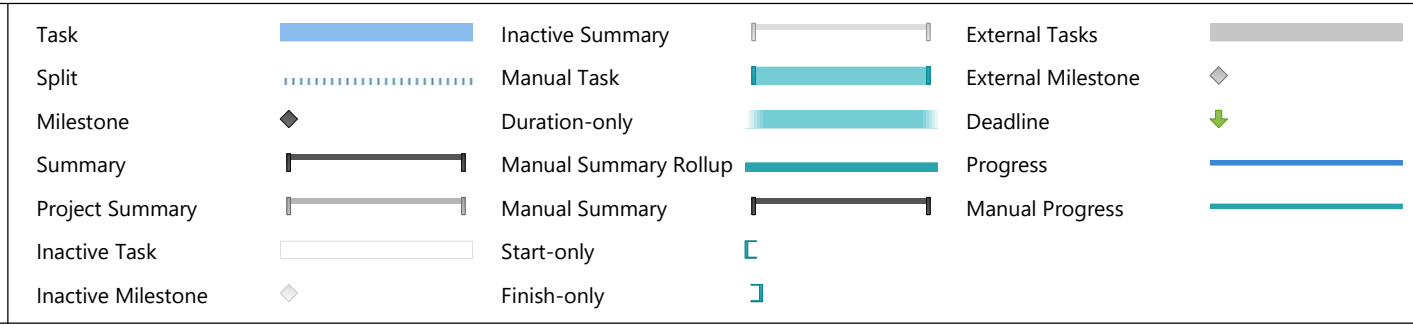
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
57		Paint	3 days	Mon 8/3/26	Wed 8/5/26		
58		Install flooring	2 days	Thu 8/6/26	Fri 8/7/26		
59		Final Clean	1 day	Fri 8/7/26	Fri 8/7/26		
60		FRP Doors and secuity Film	45 days	Mon 7/6/26	Fri 9/4/26		
61		Demo	8 days	Mon 6/15/26	Wed 6/24/26		
62		Asbestos Removal	7 days	Thu 6/25/26	Fri 7/3/26		
63		Frame	5 days	Mon 7/6/26	Fri 7/10/26		
64		MEP Rough In	15 days	Mon 7/13/26	Fri 7/31/26		
65		cement board at walls	2 days	Mon 8/3/26	Tue 8/4/26		
66		Terrazzo floor	10 days	Wed 8/5/26	Tue 8/18/26		
67		Ceilings	3 days	Wed 8/19/26	Fri 8/21/26		
68		Emergency Communication System	180 days	Mon 6/29/26	Fri 3/5/27		
69		**ROXBORO ELEMENTARY SCHOOL**	45 days	Mon 11/1/27	Fri 12/31/27		
70		Install Fire/Security System	45 days	Mon 11/1/27	Fri 12/31/27		
71		Demo Fire/Security System	10 days	Mon 12/20/27	Fri 12/31/27		
72		Demo secure Entry	5 days	Mon 11/1/27	Fri 11/5/27		
73		Install security window and package reciever	2 days	Mon 11/8/27	Tue 11/9/27		
74		Security Film	2 days	Wed 11/10/27	Thu 11/11/27		
75		Framing	2 days	Thu 11/11/27	Fri 11/12/27		



Project: Safety and Security Sch
Date: Mon 8/18/25

Task
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Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
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Duration-only
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External Milestone
Deadline
Progress
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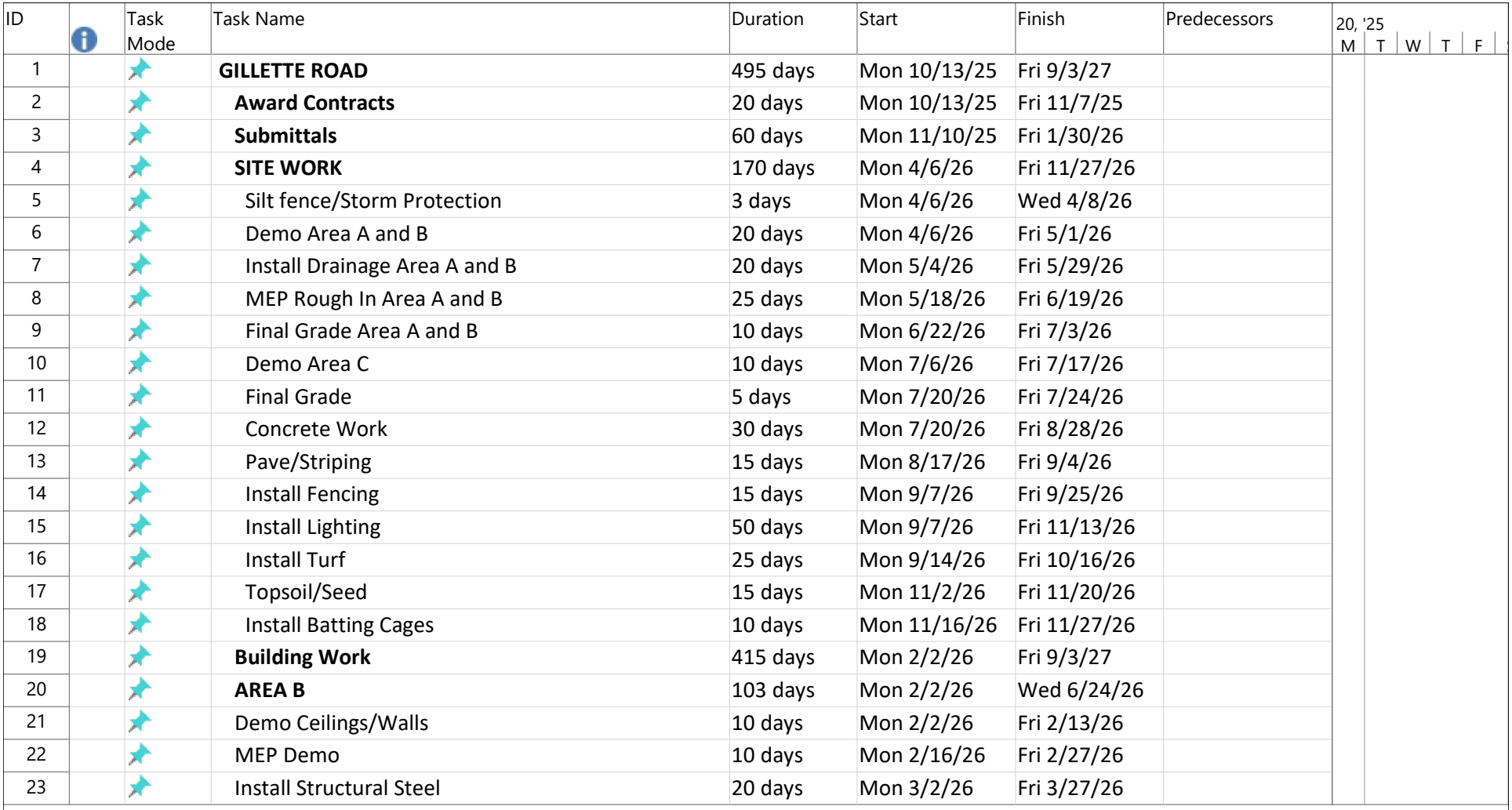
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
76		Gyp and Finish	4 days	Mon 11/15/27	Thu 11/18/27		
77		Paint	1 day	Fri 11/19/27	Fri 11/19/27		
78		Ceilings	2 days	Mon 11/22/27	Tue 11/23/27		
79		Flooring	2 days	Wed 11/24/27	Thu 11/25/27		
80		Final Clean	1 day	Fri 11/26/27	Fri 11/26/27		
81		**Roxboro Middle School**	130 days	Mon 11/1/27	Fri 4/28/28		
82		Security Film and Identification	20 days	Mon 11/15/27	Fri 12/10/27		
83		Demo Secure Entry	3 days	Mon 12/20/27	Wed 12/22/27		
84		Framing	2 days	Thu 12/23/27	Fri 12/24/27		
85		Install Window and Package Reciever	2 days	Mon 12/27/27	Tue 12/28/27		
86		Gyp and Finish	4 days	Wed 12/29/27	Mon 1/3/28		
87		Paint	2 days	Tue 1/4/28	Wed 1/5/28		
88		Install Fire/Security System	78 days	Wed 12/22/27	Fri 4/7/28		
89		Demo Fire/Security System	15 days	Mon 4/10/28	Fri 4/28/28		



Project: Safety and Security Sch
Date: Mon 8/18/25

Task
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Milestone
Summary
Project Summary
Inactive Task
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External Milestone
Deadline
Progress
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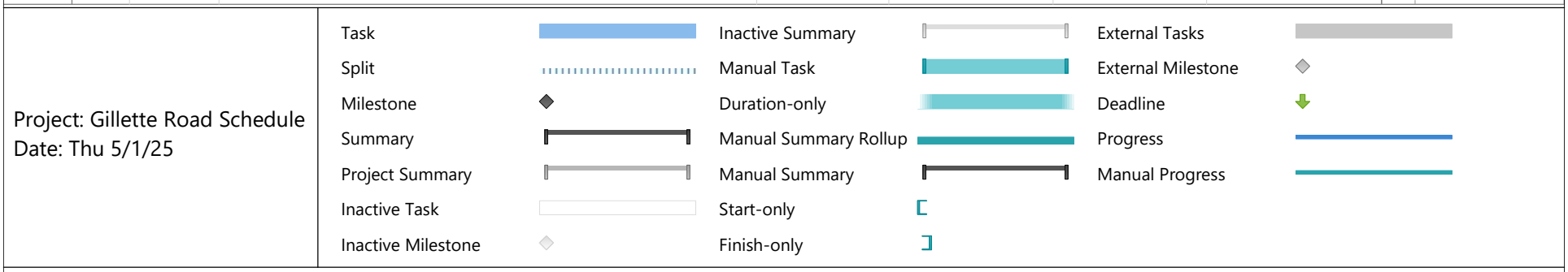
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**GILLETTE ROAD**	495 days	Mon 10/13/25	Fri 9/3/27	
2		**Award Contracts**	20 days	Mon 10/13/25	Fri 11/7/25	
3		**Submittals**	60 days	Mon 11/10/25	Fri 1/30/26	
4		**SITE WORK**	170 days	Mon 4/6/26	Fri 11/27/26	
5		Silt fence/Storm Protection	3 days	Mon 4/6/26	Wed 4/8/26	
6		Demo Area A and B	20 days	Mon 4/6/26	Fri 5/1/26	
7		Install Drainage Area A and B	20 days	Mon 5/4/26	Fri 5/29/26	
8		MEP Rough In Area A and B	25 days	Mon 5/18/26	Fri 6/19/26	
9		Final Grade Area A and B	10 days	Mon 6/22/26	Fri 7/3/26	
10		Demo Area C	10 days	Mon 7/6/26	Fri 7/17/26	
11		Final Grade	5 days	Mon 7/20/26	Fri 7/24/26	
12		Concrete Work	30 days	Mon 7/20/26	Fri 8/28/26	
13		Pave/Striping	15 days	Mon 8/17/26	Fri 9/4/26	
14		Install Fencing	15 days	Mon 9/7/26	Fri 9/25/26	
15		Install Lighting	50 days	Mon 9/7/26	Fri 11/13/26	
16		Install Turf	25 days	Mon 9/14/26	Fri 10/16/26	
17		Topsoil/Seed	15 days	Mon 11/2/26	Fri 11/20/26	
18		Install Batting Cages	10 days	Mon 11/16/26	Fri 11/27/26	
19		**Building Work**	415 days	Mon 2/2/26	Fri 9/3/27	
20		**AREA B**	103 days	Mon 2/2/26	Wed 6/24/26	
21		Demo Ceilings/Walls	10 days	Mon 2/2/26	Fri 2/13/26	
22		MEP Demo	10 days	Mon 2/16/26	Fri 2/27/26	
23		Install Structural Steel	20 days	Mon 3/2/26	Fri 3/27/26	



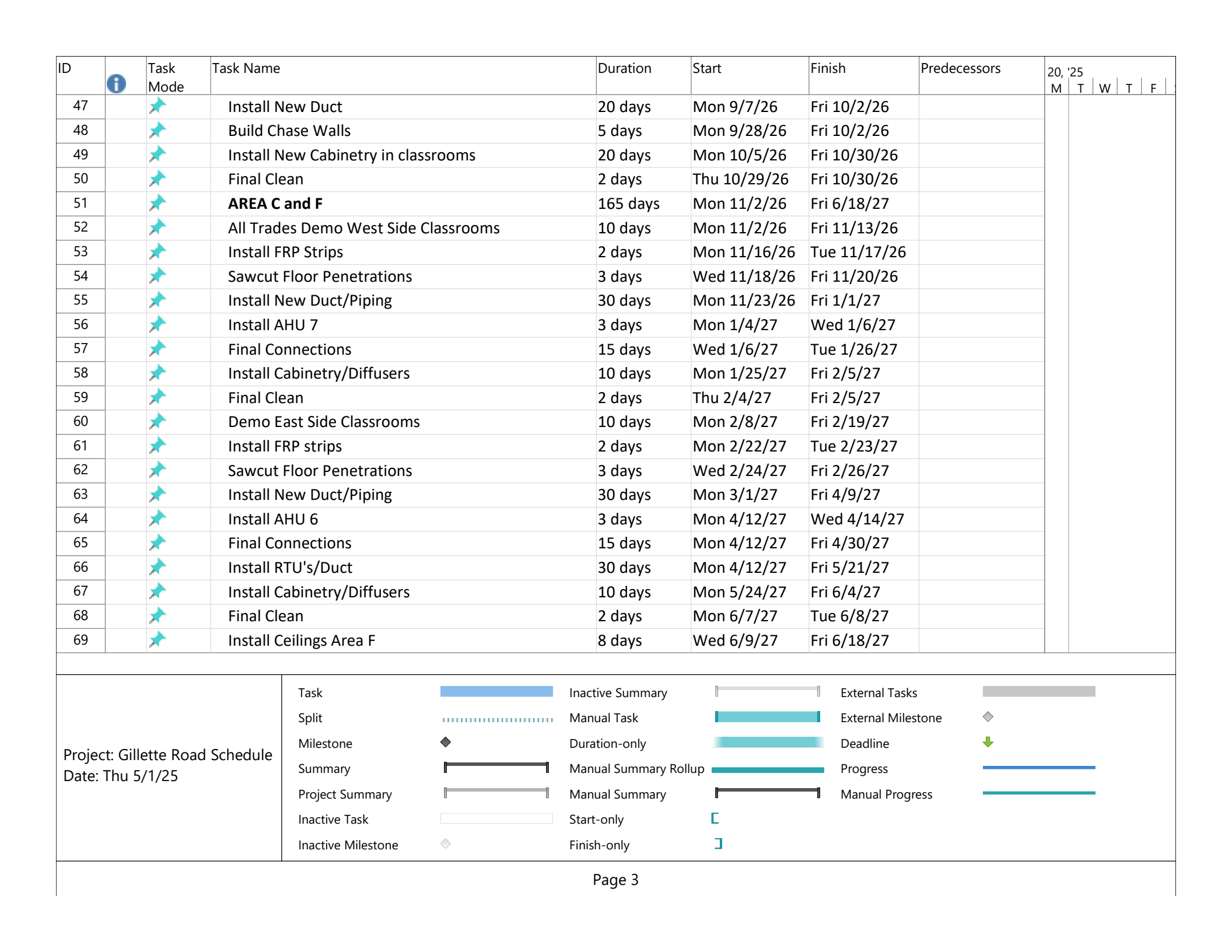
Project: Gillette Road Schedule
Date: Thu 5/1/25

Task
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Project Summary
Inactive Task
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Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
24		Cut Penetrations in Floor	5 days	Mon 3/30/26	Fri 4/3/26	
25		Install Duct/Piping	20 days	Mon 4/6/26	Fri 5/1/26	
26		Install AHU B-5	20 days	Mon 4/27/26	Fri 5/22/26	
27		Build Walls	5 days	Mon 5/25/26	Fri 5/29/26	
28		Finish/Paint Walls	5 days	Mon 6/1/26	Fri 6/5/26	
29		Install Ceilings	5 days	Mon 6/8/26	Fri 6/12/26	
30		Paint	5 days	Mon 6/15/26	Fri 6/19/26	
31		Final Clean	3 days	Mon 6/22/26	Wed 6/24/26	
32		**AREA E**	95 days	Mon 6/22/26	Fri 10/30/26	
33		ACM Removal Basement	15 days	Mon 6/22/26	Fri 7/10/26	
34		ACM Removal First Floor	15 days	Mon 6/29/26	Fri 7/17/26	
35		Demo Basement/First Floor	20 days	Mon 6/29/26	Fri 7/24/26	
36		MEP Demo Basement/First Floor	20 days	Mon 6/29/26	Fri 7/24/26	
37		Demo Second Floor	10 days	Mon 7/13/26	Fri 7/24/26	
38		MEP Demo Second Floor	10 days	Mon 7/13/26	Fri 7/24/26	
39		Install FRP Strips	7 days	Mon 7/20/26	Tue 7/28/26	
40		Sawcut Floors For New Ductwork	8 days	Mon 8/3/26	Wed 8/12/26	
41		Install AHU 15	5 days	Mon 7/6/26	Fri 7/10/26	
42		Install New Duct	20 days	Mon 7/13/26	Fri 8/7/26	
43		Build Chase Walls	5 days	Mon 8/10/26	Fri 8/14/26	
44		Install cabinetry in rooms 011,013,014,015,016,017,018,211,213,214,215,216	20 days	Mon 8/10/26	Fri 9/4/26	
45		Final Clean	2 days	Thu 9/3/26	Fri 9/4/26	
46		Install AHU 16	5 days	Mon 9/7/26	Fri 9/11/26	



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
47		Install New Duct	20 days	Mon 9/7/26	Fri 10/2/26	
48		Build Chase Walls	5 days	Mon 9/28/26	Fri 10/2/26	
49		Install New Cabinetry in classrooms	20 days	Mon 10/5/26	Fri 10/30/26	
50		Final Clean	2 days	Thu 10/29/26	Fri 10/30/26	
51		**AREA C and F**	165 days	Mon 11/2/26	Fri 6/18/27	
52		All Trades Demo West Side Classrooms	10 days	Mon 11/2/26	Fri 11/13/26	
53		Install FRP Strips	2 days	Mon 11/16/26	Tue 11/17/26	
54		Sawcut Floor Penetrations	3 days	Wed 11/18/26	Fri 11/20/26	
55		Install New Duct/Piping	30 days	Mon 11/23/26	Fri 1/1/27	
56		Install AHU 7	3 days	Mon 1/4/27	Wed 1/6/27	
57		Final Connections	15 days	Wed 1/6/27	Tue 1/26/27	
58		Install Cabinetry/Diffusers	10 days	Mon 1/25/27	Fri 2/5/27	
59		Final Clean	2 days	Thu 2/4/27	Fri 2/5/27	
60		Demo East Side Classrooms	10 days	Mon 2/8/27	Fri 2/19/27	
61		Install FRP strips	2 days	Mon 2/22/27	Tue 2/23/27	
62		Sawcut Floor Penetrations	3 days	Wed 2/24/27	Fri 2/26/27	
63		Install New Duct/Piping	30 days	Mon 3/1/27	Fri 4/9/27	
64		Install AHU 6	3 days	Mon 4/12/27	Wed 4/14/27	
65		Final Connections	15 days	Mon 4/12/27	Fri 4/30/27	
66		Install RTU's/Duct	30 days	Mon 4/12/27	Fri 5/21/27	
67		Install Cabinetry/Diffusers	10 days	Mon 5/24/27	Fri 6/4/27	
68		Final Clean	2 days	Mon 6/7/27	Tue 6/8/27	
69		Install Ceilings Area F	8 days	Wed 6/9/27	Fri 6/18/27	



Project: Gillette Road Schedule
Date: Thu 5/1/25

Task
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Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
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Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
70		**AREA A**	54 days	Mon 6/21/27	Thu 9/2/27	
71		Demo Ceilings/Vest. 1	10 days	Mon 6/21/27	Fri 7/2/27	
72		MEP Demo	15 days	Mon 6/21/27	Fri 7/9/27	
73		Install Duct/Piping	20 days	Mon 7/12/27	Fri 8/6/27	
74		Install New RTU's	25 days	Mon 7/12/27	Fri 8/13/27	
75		Install Ceilings	15 days	Mon 8/9/27	Fri 8/27/27	
76		Complete Finishes Vest. V1	10 days	Wed 8/18/27	Tue 8/31/27	
77		Final Clean	2 days	Wed 9/1/27	Thu 9/2/27	
78		**AREA D**	50 days	Mon 6/28/27	Fri 9/3/27	
79		Demo	15 days	Mon 6/28/27	Fri 7/16/27	
80		Install New Duct/Piping	25 days	Mon 7/12/27	Fri 8/13/27	
81		Install New RTU's	5 days	Mon 8/2/27	Fri 8/6/27	
82		Final Connections to RTU's	15 days	Mon 8/9/27	Fri 8/27/27	
83		Install Ceilings	5 days	Wed 8/25/27	Tue 8/31/27	
84		Final Clean	3 days	Wed 9/1/27	Fri 9/3/27	

Project: Gillette Road Schedule
Date: Thu 5/1/25

Task
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Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
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Manual Task
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Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

SECTION 014533 - SPECIAL INSPECTION AND TESTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Special Inspection and Testing shall be in accordance with Chapter 17 of the 2020 Building Code of New York State (BCNYS).

B. The program of Special Inspection and Testing is a quality assurance program intended to ensure that the work is performed in accordance with the Contract Documents.

C. This specification section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Approved Special Inspection Agency, hereinafter referred to as the Special Inspector (SI), and other Agents of the SI, of their requirements and responsibilities.

D. The SI shall be the individual in charge of the Special Inspection and Testing program. The SI shall supervise and review the work of the Inspection and Testing Agents for each inspection or test. As explained in BCNYS Section 1704.2.1, the SI, and all its Agents, shall demonstrate competence to the satisfaction of the Registered Design Professional in Responsible Charge (RDPIRC) and the Building Official (BO) for inspection or testing of the particular type of construction or operation requiring special inspection or testing. Unless otherwise noted or agreed upon by the RDPIRC and the BO, the minimum qualifications are as follows:

1. Concrete Construction (excluding prestressed and/or post-tensioned concrete):

    a. Inspection (excluding inspection of post-installed adhesive anchors installed in horizontal or upwardly-inclined orientations to resist sustained tension loads and inspection of concrete restoration materials and procedures, bonded FRP reinforcement, and crack rehabilitation by injection grouting): ACI Concrete Construction Special Inspector, ICC Reinforced Concrete Special Inspector, NICET Level II, Engineer-in-Training (EIT) with relevant experience, or Professional Engineer (PE) with relevant experience.
    b. Inspection of post-installed adhesive anchors installed in horizontal or upwardly-inclined orientations to resist sustained tension loads: ACI/CRSI Adhesive Anchor Installer Certification.
    c. Field Testing (sampling, slump and temperature testing only): ACI Field Testing Technician – Grade 1, or NICET Level I.
    d. Field Testing (other than sampling, slump and temperature testing): ACI Field Testing Technician – Grade 1, or NICET Level II.
    e. Laboratory Testing: ACI Concrete Laboratory Testing Technician – Grade 1, or NICET Level II.

2. Soils:

    a. Inspection: ICC Soils Special Inspector, EIT with relevant experience, PE with relevant experience.

b. Testing (sampling, sieve analysis, unit weight and moisture content tests only): NICET Level I.
c. Testing (other than sampling, sieve analysis, unit weight and moisture content testing): NICET Level II.

3. Fire-Resistant Penetrations and Joints: IFC Firestop Special Inspector, Intertek Qualified Firestop Inspector, or ICC Firestopping Credential of Learning Achievement (CLA).

E. Frequency of Special Inspection or Testing: The individual special inspections and tests shall be performed either continuously or on a periodic basis, as defined below, in accordance with the Statement of Special Inspection and Testing:

1. Inspection, Continuous: The full-time observation of work requiring special inspection by an approved Special Inspector, or Agent, who is continuously present in the work area where the work is being performed.
2. Inspection, Periodic: The intermittent observation of work requiring special inspection by an approved Special Inspector, or Agent, who is present in the work area where the work has been or is being performed, and at the completion of the work.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. Statement of Special Inspection and Testing (see Section 014533a).

1.3 PAYMENT

A. The Owner, or an Owner's Authorized Agent, shall engage and pay for the services of the SI and its Agents.

B. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents, and any costs related to correcting the deficient work.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. The Statement of Special Inspection and Testing shall be submitted to the BO with the application for Building Permit.

B. The Contractor shall cooperate with the SI and its Agents, so the special inspections and testing can be performed without hindrance.

C. The Contractor shall provide adequate OSHA-compliant access for the Special Inspector and its Agents to perform their work. This includes access to pipe scaffolds, swing-stage scaffolds, and any other method of accessing the work areas that the Contractor or its agents use to perform the work of the Contract.

D. The Contractor shall review the Statement of Special Inspection and Testing and shall, unless other agreed arrangements have been made, be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the SI and/or the applicable Agents at least 24 hours in advance of a required test or inspection. Uninspected work requiring inspection may be rejected solely on that basis.

E. The Contractor shall provide incidental labor and facilities to:

1. Provide access to the work to be inspected or tested.
2. Obtain and handle samples at the site or at the source of products to be tested.
3. Facilitate tests and inspections.
4. Store and cure test samples.

F. The Contractor shall keep at the project site a current set of construction drawings and specifications, job drawings, and approved shop drawings for use by the Special Inspector and its Agents.

G. The Special Inspection and Testing program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control program. All work subjected to special inspection and testing shall first be reviewed by the Contractor's Quality Control personnel.

H. The Contractor shall acknowledge each item listed as a discrepancy by the Special Inspection and Testing program in writing to the RDPIRC and Owner. The acknowledgment shall identify whether or not the discrepancy has been corrected, complies with the contract documents, and is ready for re-inspection.

I. The Contractor shall ensure all products, materials or assemblies are properly labeled so the Special Inspector or its Agents can easily observe the label to confirm compliance with the approved construction documents.

J. The Contractor shall be solely responsible for construction site safety.

1.5 LIMITS ON SPECIAL INSPECTOR AND TESTING AGENT AUTHORITY

A. Neither the SI nor its Agents may release, revoke, alter, or expand on the requirements of the Contract Documents.

B. The SI and its Agents will not have control over the Contractor's means and methods of construction.

C. Neither the SI nor its Agents shall be responsible for construction site safety.

D. Neither the SI nor its Agents shall have authority to stop the work.

1.6 RESPONSIBILITIES OF SPECIAL INSPECTOR AND INSPECTION AND TESTING AGENTS

A. The SI shall submit to the RDPIRC and BO for review and approval a copy of their qualifications and qualifications of all Agents, which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.

B. The SI, and all Agents, shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

C. The SI and its Agents shall have adequate equipment to perform the required tasks. The equipment shall be periodically calibrated in accordance with equipment manufacturers' recommendations.

D. The SI and its Agents shall notify the Contractor of their presence on the job site at the start of any required inspection or test.

E. The SI and its Agents shall notify the Contractor of the results of any inspection or test upon completion of the inspection or testing task, including any discrepancies noted. The SI shall report any discrepancies from the Contract Documents found during an inspection. If the discrepancies are not corrected during the inspection, the SI shall notify the RDPIRC and BO prior to the completion of that phase of work. Reports shall document all discrepancies identified and the corrective action taken.

F. The SI and its Agents shall prepare detailed reports of each inspection or test and submit the reports within three days of the inspection or test. Reports shall be in electronic format (legible handwritten reports may be submitted if final typed copies are not available) and include:

1. Date and time of test or inspection.
2. Name of inspector or technician and name of inspection or testing firm representing.
3. Location of specific areas tested or inspected.
4. Weather conditions (temperature, wind speed, humidity, cloud cover, etc.).
5. Description of test or inspection, including applicable ASTM standards.
6. Results of inspection and\or testing.
7. Identification of discrepancies.
8. Indication that contractor was made aware of discrepancies.
9. Whether or not the discrepancies were corrected.
10. Signature of inspector, or of the individual overseeing the inspection of testing.

G. Inspection and testing reports shall be submitted to the RDPIRC, Owner or Owner's Authorized Agent, and BO, or as agreed upon at the Special Inspection and Testing pre-construction meeting.

H. A Special Inspection and Testing pre-construction meeting shall be held by the SI. The meeting shall include any Inspection and Testing Agents, the Contractor and any applicable subcontractors, the Owner or Owner's Authorized Agent, and the RDPIRC. The purpose of the meeting shall be to identify the specifics of the Special Inspection and Testing program, including, but not limited to, the following:

1. Identify the SI and Testing Agents.
2. Review this specification section and Statement of Special Inspection and Testing.
3. Determine the distribution list for inspection and testing reports.
4. Provide contact information.
5. Determine which party shall schedule inspections and testing.

I. The SI and its Agents shall notify the RDPIRC by telephone or email of any test results which fail to comply with the requirements of the Contract Documents.

J. At the completion of the work requiring special inspections or testing, each Inspection and Testing Agent shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.7 FINAL REPORT OF SPECIAL INSPECTION AND TESTING

A. The Final Report of Special Inspection and Testing shall be completed by the SI and submitted to the RDPIRC, the Owner or Owner's Authorized Agent, and BO prior to the issuance of a Certificate of Use and Occupancy.

B. The Final Report of Special Inspections and Testing will document that all required inspections have been performed and that all discrepancies have been resolved. Any unresolved discrepancies shall be clearly noted.

PART 2 PRODUCTS (Not used)

PART 3 EXECUTION (Not used)

END OF SECTION 014533

king + king ARCHITECTS

SECTION 014533a – STATEMENT OF SPECIAL INSPECTION AND TESTING

Project: North Syracuse Central School District – 2023 Safety and Security Improvements

Project Location: Cicero, NY

Building(s) Covered by This Statement of Special Inspections and Testing:

- CNS High School (SED Project No. 42-03-03-06-0-16-036)
- Junior High School (SED Project No. 42-03-03-06-0-11-027)
- Gillette Road Middle School (SED Project No. 42-03-03-06-0-12-021)
- Roxboro Road Middle School (SED Project No. 42-03-03-06-0-10-022)
- Roxboro Road Elementary School (SED Project No. 42-03-03-06-0-08-019)
- Allen Road Elementary School (SED Project No. 42-03-03-06-0-01-023)
- Bear Road Elementary School (SED Project No. 42-03-03-06-0-02-017)
- Smith Road Elementary School (SED Project No. 42-03-03-06-0-09-017)
- District Office (SED Project No. 42-03-03-06-0-07-014)

Code Enforcement Jurisdiction: New York State Department of State

Owner: North Syracuse Central School District

Architect & Structural Engineer: King + King Architects

King + King Project No.: 23-44-7866 / 23-44-7868

Special Inspector: To be determined

Governing Building Code: 2020 Uniform Code of New York State

Statement: As the Registered Design Professional in Responsible Charge of the structural aspects of this project, I certify that this Statement of Special Inspection and Testing includes the materials, systems, components and work required to have special inspection or testing in accordance with Chapter 17 of the 2020 Building Code of New York State (BCNYS). Outlined herein are the type and extent of each special inspection and test; identification as to whether the special inspections are to be continuous or periodic special inspection; listing of applicable reference standards and Building Code references for each special inspection or test.



Signature: Kelly M. Covert

Name: **Kelly M. Covert**

Statement Date: **8 May 2025**

It is a violation of New York State Education Law Article 145 for any person, unless acting under the direction of a licensed professional engineer, to alter this document in any way. If this document is altered, the altering engineer shall affix to this document their seal and the notation "altered by" followed by their signature and the date of such alteration, and a specific description of the alteration.

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
A. Structural Steel Construction			AISC 360-2016: Ch. N	1705.2	See Specification Section 051200
1. Shop inspections / testing of structural steel, as defined by AISC 303-2016			AISC 360-2016: Ch. N7	1704.2.5, 1705.2, 2205	Shop inspections required during fabrication if fabrication is performed by a fabricator not registered and approved to perform such work without special inspection. See 1704.2.5.1
2. Welding Inspections Prior to Welding			AISC 360-2016: Ch. N5.4, Table N5.4-1		Perform the following inspections prior to welding. **NOTE: Letter "F" in "Continuous" column requires the welding inspector to perform continuous inspection for all PJP or CJP groove welds performed in the field.**
a. Verify Weld Procedure Specification (WPS) available					Each WPS
b. Verify manufacturer certifications for welding consumables available					Each consumable used
c. Verify material identification (type, grade)	F	X			Each material
d. Verify welder identification system	F	X			
e. Verify fit-up of groove welds, including joint geometry	F	X			Joint preparation, dimensions (alignment, root opening, roof face, bevel), cleanliness (condition of steel surfaces), tacking (tack weld quality and location), backing type and fit (if applicable).
f. Verify configuration and finish of weld access holes	F	X			.
g. Verify fit-up of fillet welds		X			Dimensions (alignment, gaps at root), cleanliness (condition of steel surfaces), tacking (tack weld quality and location)
3. Welding Inspections During Welding			AISC 360-2016: Ch. N5.4, Table N5.4-2		Perform the following inspections during welding. **NOTE: Letter "F" in "Continuous" column requires the welding inspector to perform continuous inspection for all PJP or CJP groove welds performed in the field.**
a. Verify use of qualified welders	F	X			Each welder
b. Verify control and handling of welding consumables	F	X			Verify packaging, exposure control. Verification required for all groove welds to be performed in field, periodic for other welds.

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
c. Verify no welding over cracked tack welds	F	X			Verification required for all groove welds to be performed in field, periodic for other welds.
d. Verify environmental conditions	F	X			Verify wind speed within limits, precipitation and temperature. Verification required for all groove welds to be performed in field, periodic for other welds.
e. Verify WPS followed	F	X			Settings on welding equipment, travel speed, selected welding materials, shielding gas type and flow rate, preheat applied, interpass temperature maintained, proper position (flat, vert., horiz., overhead). Verification required for all groove welds to be performed in field, periodic for other welds.
f. Verify welding techniques	F	X			Interpass and final cleaning, each pass within profile limitations, each pass meets quality requirements. Verification required for all groove welds to be performed in field, periodic for other welds.
4. Welding Inspections After Welding			AISC 360-2016: Ch. N5.4, Table N5.4-3		Perform the following inspections after welding. **NOTE: Letter "F" in "Continuous" column requires the welding inspector to perform continuous inspection for all PJP or CJP groove welds performed in the field.**
a. Verify welds cleaned	F	X			
b. Verify size, length and location of welds					Each welded joint
c. Verify welds meet visual acceptance criteria			AWS D1.1-2015: Table 6.1		Each welded joint. Visual inspection of welds in all steels may begin immediately after completed welds have cooled to ambient temperature
1) Crack prohibition					Any crack is unacceptable, regardless of size and location
2) Weld/base-metal fusion					Thorough fusion shall exist between adjacent layers of weld metal and between weld metal and base metal
3) Crater cross-section					All craters shall be filled to provide the specified weld size, except for the ends of intermittent fillet welds outside of their effective length
4) Weld profiles					Profiles shall be in accordance with AWS D1.1-2015: Sect. 5.24
5) Weld size					Undersized welds: The size of a fillet weld in any continuous weld may be less than the specified nominal size (L) without correction by the following amounts (U): L=3/16" and smaller, Umax=1/16". 3/16"<L<1/4", Umax=3/32" L>1/4", Umax=1/8" In all cases, the undersized portion of weld shall not exceed 10 percent of the weld length. On web-to-flange welds on girders, no underrun is permitted at the ends for a length equal to twice the width of the flange

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
6) Undercut					For all welds with material less than 1" thick, undercut shall not exceed 1/32", except that a max. 1/16" is permitted for an accumulated length of 2" in any 12" length of weld. For material > 1" thick, undercut shall not exceed 1/16" for any length of weld. For tubular connections and cyclically loaded non-tubular connections in primary members, undercut shall be no more than .01" deep when the weld is transverse to tensile stress under any design loading condition. Undercut shall be no more than 1/32" deep for all other cases
7) Porosity					For all CJP welds in butt joints transverse to the directed of tensile stress shall have no visible piping porosity. For all other groove welds and fillet welds, the sum of the visible piping porosity 1/32" or greater in diameter shall not exceed 3/8" in any linear inch of weld and shall not exceed 3/4" in any 12" length of weld. For tubular connections and cyclically loaded non-tubular connections, the frequency of piping porosity in fillet welds shall not exceed one in each 4" of weld length and the max. diameter shall not exceed 3/32", except for fillet welds connecting stiffeners to webs, the sum of the diameters of piping porosity shall not exceed 3/8" in any linear inch of weld and shall not exceed 3/4" in any 12" length of weld. For tubular connections and cyclically loaded non-tubular connections, CJP welds in butt joints transverse to the directed of tensile stress shall have no visible piping porosity. For all other groove welds and fillet welds, the frequency of piping porosity shall not exceed one in 4" length of weld and the max. diameter shall not exceed 3/32"
d. Verify arc strikes properly repaired			AWS D1.1-2015		Each arc strike
e. Verify k-area					For each occurrence, verify no cracks within 3 inches of weld for doubler plates, continuity plates or stiffener plates
f. Verify backing and weld tabs removed					Each occurrence (if required)
g. Verify repair activities					Each repair
5. Non-Destructive Testing (NDT) of Welded Joints			AISC 360-2016: Ch. N5.5a; AWS D1.1-2015		Perform Ultrasonic Testing (UT), Magnetic Particle Testing (MT), Penetrant Testing (PT) and Radiographic Testing (RT) where required

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
a. NDT of CJP groove welds			AISC 360-2016: Ch. N5.5b		For structures in Risk Category III or IV, perform UT on all CJP groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials 5/16" thick or greater. For structures in Risk Category II, perform UT on 10 percent of CJP groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials 5/16" thick or greater.
b. NDT of weld access holes			AISC 360-2016: Ch. N5.5c		Perform MT or PT on thermally cut surfaces of access holes when the flange thickness exceeds 2" for built-up shapes. Any crack shall be deemed unacceptable regardless of size or location
6. Inspection of High-Strength Bolted Connections			AISC 360-2016: Ch. N5.6; RCSC Specification		Confirm materials, procedures and workmanship are in conformance with the approved construction documents and the provisions of the RCSC Specification. Inspect bolted connections on periodic/random basis
a. Inspections Prior to Bolting			AISC 360-2016: Ch. N5.6, Table N5.6-1		
1) Verify manufacturer's certifications available for fastener materials					Each material
2) Verify fasteners marked in accordance with ASTM requirements		X			
3) Verify proper fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)		X			
4) Verify proper bolting procedure selected for joint detail		X			
5) Verify connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements		X			
6) Verify pre-installation verification testing by installation personnel for fastener assemblies and methods used		X			Pre-tensioned and slip-critical joints only
7) Verify proper storage provided for bolts, nuts, washers and other fastener components		X			

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
b. Inspections During Bolting			AISC 360-2016: Ch. N5.6, Table N5.6-2		
1) Verify fastener assemblies, of suitable condition, placed in all holes, and washers (if required) are positioned as required		X			
2) Verify joint brought to the snug-tight condition prior to pretensioning		X			
3) Verify fastener component not turned by the wrench prevented from rotating		X			
4) Verify fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges		X			Pre-tensioned and slip-critical joints only. Inspections shall be performed during fastening when installer is using the calibrated wrench method or the turn-of-the-nut method without matchmarking
7. Other Inspection Tasks			AISC 360-2016: Ch. N5.7		
a. Verify anchor rods or embedded items for specified size or diameter, type, grade and length, and depth of embedment prior to concrete placement					Each embedded item, prior to concrete placement
b. Verify fabricated or erected steel frame, as appropriate, complies with the details shown on the construction drawings for location and proper application of joint details for members, braces and stiffeners					Each structural element and connection
B.					
C. Concrete Construction			ACI 318-2014	1705.3, Table 1705.3	See Division 3 specification sections.
1. Inspect Reinforcement and Verify Placement		X	ACI 318-2014 Ch. 20, 25, 26	1908.4	Verify type, size, grade, placement, bend details, laps, splices, cover, spacing and corrosion protection
2. Inspect Anchors Cast in Concrete		X	ACI 318-2014: 17.8.2		Verify type, size, grade, embedment, and placement location of anchors to be embedded into concrete
3. Inspect Anchors Post-installed in Hardened Concrete Members		X			Verify type, size, grade, embedment, and placement location of anchors to be installed into hardened concrete members
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads	X		ACI 318-2014: 17.8.2.4		

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
b. Mechanical anchors and adhesive anchors not installed in horizontally or upwardly inclined orientations to resist sustained tension loads		X	ACI 318-2014: 17.8.2		
4. Inspect Formwork for Shape, Location and Dimensions of the Concrete Being Formed		X	ACI 318-2014: 26.11.1.2(b)		
5. Cast-in-Place Concrete					
a. Verify use of required design mix		X	ACI 318-2014: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2	
b. Inspect concrete placement for proper application techniques	X		ACI 318-2014: 26.5		
c. Sample fresh concrete			ASTM C172, ACI 318-2014: 26.4, 26.5, 26.12		
1) Perform slump tests		X	ASTM C143		One test at point of discharge for each day's placement of each class of concrete; additional tests when concrete consistency seems to have changed and each time a set of compression test specimens are made
2) Perform air-content tests		X	ASTM C173 (lightweight concrete), ASTM C231 (normal-weight concrete)		One test for each day's placement of each class of air-entrained concrete, and each time a set of compression test specimens are made
3) Determine the temperature of concrete		X	ASTM C1064		Test each time a set of compression test specimens are made; test hourly when air temperature is 40 deg. F and below and when 80 deg. F and above
4) Fabricate compression test specimens		X	ASTM C31		Obtain one set of six 6-inch x 12-inch cylinders for each day's placement under 25 CY, then 50 CY thereafter, for each class of concrete per day
6. Review Adequacy of Test Cylinder Curing Box(es)					Each project site
7. Perform Compression Testing on Test Cylinders in Laboratory		X	ASTM C39		For each set of six specimens, test two specimens at 7 days, two specimens at 28 days, and hold two specimens for later testing if required
8. Material Tests		X	ACI 318-2014: Ch. 19 & 20	1705.3.2	Material testing required only if sufficient data is not provided on submittals.
9. Verify Maintenance of Specified Curing Temperature and Techniques		X	ACI 318-2014: 26.4.7-26.4.9	1908.9	
10. Verify in-situ Concrete Strength Prior to Removal of Shores and Forms for Beams and Structural Slabs		X	ACI 318-2014: 26.11.2		
11. Verify Floor Flatness and Levelness					Verify compliance with specification section 033000 for each floor area

INSPECTION / TEST	Continuous	Periodic	REFERENCE STANDARD	BCNYS REFERENCE	COMMENTS
D. Soils				1705.6, Table 1705.6	See Division 31 specification sections. See Geotechnical Evaluation Report
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity		X			Verify at all footing bearing locations
2. Verify excavations are extended to proper depth and have reached proper material		X			Verify at all excavations. Verify all unsuitable materials have been removed
3. Perform classification and testing of compacted fill materials		X			Perform at all compacted fill locations
4. Verify use of proper materials, densities and lift thickness during placement and compaction of compacted fill	X		ASTM D1556, ASTM D2922, ASTM D3017		Verify at each compacted fill location. Perform one compaction test per lift below each isolated footing, every 30 LF below strip footings, and each 3000 SF below slabs, per lift
5. Prior to placement of compacted fill, inspect subgrade and verify the subgrade is not frozen and has been prepared properly		X			Verify at each compacted fill location
6. Observe proofrolling. Verify no unstable materials		X			Observe at each location requiring proofrolling
E. Fire-Resistant Penetrations and Joints				1705.17	In high-rise buildings or in buildings with Risk Category III or IV, inspections for through-penetrations, membrane penetration firestops, fire-resistant joint systems and perimeter fire barrier systems that are tested and listed in accordance with Sects. 714.3.1.2, 714.4.2, 715.3 and 715.4 shall be in accordance with 1705.17.1 or 1705.17.2
1. Penetration firestops			ASTM E2174	1705.17.1	Inspect penetration firestop systems that are tested and listed in accordance with Sects. 714.3.1.2 and 714.4.2
2. Fire-resistant joint systems			ASTM E2393	1705.17.2	Inspect fire-resistant joint systems that are tested and listed in accordance with Sects. 715.3 and 715.4

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities. All items shall be provided by the General Contractor unless specified otherwise.
   1. This section applies to Prime Contractors and their subcontractors. The Milestone-Guideline Schedule shows areas of the building where construction activities are to occur. Each Prime Contractor shall provide temporary facilities necessary to allow building to operate as a normal educational facility. Reroute and extend all existing services as required. Provide any temporary facility that may be required to maintain occupancy and complete Contract Work in conjunction with the Milestone- Guideline Schedule. Provide whatever temporary facilities may be required to complete Contract Work.

B. Temporary utilities required include but are not limited to:
   1. Ventilation and humidity control
   2. Water service and distribution
   3. Storm water control
   4. Waste piping
   5. Sanitary facilities including toilets, wash facilities and drinking water facilities
   6. Telephone, fax, internet services
   7. Electric power service
   8. Lighting
   9. Support facilities
   10. Security and protection
   11. Temporary construction
   12. Temporary building heat
   13. Temporary roof drains

C. Temporary construction and support facilities required include but are not limited to:
   1. Field offices and storage sheds
   2. Temporary enclosures
   3. Temporary partitions
   4. Temporary doors and windows
   5. Temporary site entrance and staging areas
   6. Sanitary facilities including drinking water
   7. Dewatering facilities and drains

8. Temporary heating and ventilation
9. Weather protection
10. Temporary project identification signs and bulletin boards
11. Cleanup and waste disposal services
12. Construction aids and miscellaneous services and facilities
13. Moving requirements (if needed)

D. Security and protection facilities requires but are not limited to:
1. Temporary fire protection
2. Storm water control
3. Tree and plant protection
4. Pest control
5. Security enclosure and lockup
6. Temporary partitions
7. Barricades, warning signs, lights
8. Environmental protection
9. Temporary fence

E. Relates Sections include the following:
1. Division 01 Section, “Submittals”, for procedures for submitting copies of implementation and termination schedule and utility reports.

F. Related Requirements:
1. Division 01 Section, “Summary”, for work restrictions and limitations on utility interruptions.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures that are at least equal to the thermal performance of the final construction.

B. Temporary Enclosure: Temporary heating building envelope: As determined by the CM, roofing is insulated and weather tight, exterior walls and applicable temporary partitions are weather tight, and all openings are closed with permanent construction or substantial temporary construction.

1.4 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the project to use temporary services and facilities without cost including but not limited to:
1. Owner’s Construction Forces
2. Architect
3. Occupants of Project
4. Testing Agencies

5. Construction Manager
6. Authorities Having Jurisdiction

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Each Prime Contractor shall provide temporary water service connections, hydrants, backflow preventers or fixtures to facilitate work of their contract. Coordinate with responsible utility as required.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. Each Prime Contractor shall provide temporary electric service connections facilitate work of their contract. If under contract, coordinate with the Electrical Contractor as required.

D. Gas Service from Existing System: Gas from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. Each Prime Contractor shall provide temporary gas service connections facilitate work of their contract. If under contract, coordinate with the Mechanical Contractor as required.

1.5 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within **15** days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and Authorities Having Jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture and Mold Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption, damage and mold.

F. Dust and HVAC Control Program: Each contractor is responsible to control their own dust outside of the work area. Provide a plan to include the following:
1. Locations of dust control partitions at each phase of work
2. Location of proposed air-filtration system change
3. Waste handling procedures
4. Other dust control measures

1.6 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of all Federal, State, and local governing Authorities Having Jurisdiction including but not limited to:
   1. OSHA regulations
   2. Building Code requirements
   3. Health and Safety regulations
   4. Utility company regulations
   5. Police, Fire Department and Rescue Squad rules
   6. Environmental protection regulations

B. Comply with NFPA 241, "Standard for Safeguarding Construction, Alterations and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."
   1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
   2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Tests and Inspections: Arrange for Authorities Having Jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits

D. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

E. The Site Contractor shall provide dust control, clean roadways, clean walkways and clean parking areas at the Gillette Road Elementary location. Sweep roads and parking areas daily while site construction takes place.

1.7 PROJECT CONDITIONS

A. Temporary Utilities: When acceptable to the Owner, change over from use of temporary service to use of the permanent service.

   1. Temporary Use of Permanent Facilities: engage installer of each permanent service to assume responsibility for operations, maintenance, and protection of each permanent service during its use of a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner and repair any damages without delay. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous, dangers or unsanitary conditions, or public nuisances to develop or persist on the site. Relocate temporary services and facilities as required by progress of the Work.

C. Damages: Prime Contractors shall provide for repair of damages caused by use of their temporary facilities. Walks, pavements, curbs, interior finishes, and any other existing surfaces that are broken, damaged, settled or otherwise defective as a result of receiving, handling or storage of materials or the performance of work for this project shall be fully restored at the expense of the Prime Contractor whose operations or employees caused the damage.

D. Changes: Check for Alternates and other possible changes in the work that might affect work and materials of this section.

E. Parking: There is limited parking at the project for Contractors and their employees. Parking shall be only in areas as approved by the Owner.

F. Use of Site: prime Contractor shall limit use of the site for access, parking and storage of materials to those areas approved by the Owner. Materials shall be brought into the building only by routes approved by the Owner.

G. Execution of the work by individual trades shall be coordinated with the Phasing Plan. Contractors shall coordinate the release of materials and equipment and schedule labor to meet all milestone dates. Each Contractor shall be required to provide temporary materials and use equipment as well as the labor associated with installation to allow District occupancy and use of spaces as scheduled if permanent materials/equipment are not available. Temporary materials/equipment subject to District approval.

H. Elevators are not available for use- No Exceptions.

I. No portable gas generating units or similar type equipment shall be used at the roof top level. Equipment of this nature shall be left at grade with power extended via extension cords.

1.8 STAGING AREAS AND BUILDING ACCESS

A. No temporary staging area has been identified at this time. Contractors will be allowed to place lockable storage containers at the site as directed. Contractor shall deliver materials to the school daily in conjunction with the Construction Schedule.

B. There is limited storage in the buildings. Each contractor will be allowed storage for ladders and gang boxes within the buildings. All other material storage shall be in the A-Verdi style storage container.

C. All access to the buildings must be through passageways as assigned by the Owner.

D. Contractors' personnel shall not be allowed access to any other part of the building other than the immediate construction area except by special arrangement with the Owner.

E. Each contractor shall provide protection pads, runways, etc. for all roof areas that will have to be crossed by Construction Personnel and equipment to facilitate work of their contract. Coordinate protection with the Owner's representative well in advance of roof usage.

F. The Site Contractor shall be responsible for temporary roadways necessary to access work areas at the Gillette Road location.

G. Each contractor will be responsible for obtaining background checks (Raptor) from the district on every employee to be on-site. At minimum, each respective superintendent/foreman must possess a district badge and (1) for every (5) workers for access control thereafter. Doors will not be allowed to be propped open and access will only be allowed by badges/keys. The district or CM will not be responsible for allowing building access to any contractor without background checks.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6-feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8 OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by architect from manufacturer's standard colors.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

D. Dust-Control Adhesive-Surface Walk-Off Matts: Provide mats minimum 36 by 60 inches.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

F. Lumber and Plywood: Comply with requirements in Division 06 Sections.
   1. For job built temporary offices, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing and siding.
   2. For signs and directory boards, provide exterior-type, Grade B-B high density concrete from overlay plywood of sized and thickness indicated.
   3. For fences and vision barriers, provide minimum 3/8-inch-thick exterior plywood.
   4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8- inch- thick exterior plywood.

G. Gypsum Board: Minimum 5/8-inch-thick by 48-inches wide by maximum available lengths; Type X panels with tapered edges. Comply with ASTM C 36/C 36M.

H. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

I. Paint: Comply with requirements in Division 09, "Painting Sections".

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.
2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

J. Tarpaulins: provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

K. Water: Provide potable water approved by local health authorities.

2.2 TEMPORARY FACILITIES

A. Prime Contractor Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Each Prime Contractor shall be responsible to coordinate the location/placement of their office trailer (if needed) with the Construction Manager.

C. Construction Manager will have a field office located behind the CNS High School.

D. The General Contractor shall provide the Construction Manager with the following no later than **20 days** after the Award of Contract and until final completion of all project scopes of work.
   1. Provide the following items for trailer office space as part of the base bid:
      a. One (1) Wireless Service or Wireless Service Mobile Pack- Verizon Wireless Jetpack or approved equal. Monthly fee for the duration of the project to be included.
      b. One (1) HP OfficeJet Pro 7740 Wide Format All-In-One printer Model # G5J38A and twenty-four (24) all in one replacement ink cartridges
      c. Provide Two (2) HP ENVY Laptops 17.3"-inch 12th Gen Intel Core i7 – 12GB-16GB Memory, Windows 11 Home, with built in microphone and camera.
         i. Laptops are to be equipped with Microsoft Office Suite, latest edition.
         ii. Provide Two (2) carrying cases and Two (2) wireless mouse (or latest equivalent).
      d. Five (5) rolling chairs
      e. Two (2) 11 inch iPad Air Latest generation (5th generation or newer) with 64GB and must be cellular data capable with screen protectors.
         i. Provide Two (2) protective carrying cases.
      f. One (1) electric water dispenser with hot and cold water and unlimited bottled water for the duration of the project.
      g. One (1) Keurig style single cup coffee maker with unlimited supply of K-cup coffee packs, Coffee cups, creamer and sugar.
      h. One (1) fire extinguisher
      i. One (1) First Aid kit

(Note: Items shall be provided in "new condition" and will NOT be returned to the contractor at the completion of the project.)

2.3 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

C. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system provide vented, self-contained, natural gas, liquid-propane gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

D. Heating Units: Listed and labeled for type of fuel being consumed by a qualified testing agency acceptable to Authorities Having Jurisdiction and marked for intended location and application.

E. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 – EXECUTION

3.1 SALVAGE MATERIALS

A. Salvage materials and equipment involved in performance of, but not actually incorporated into the work. Owner has first right refusal. Items selected by owner shall be salvaged and turned over (if applicable).

ITEM	LOCATION
All Door Hardware	Various Locations
Access Control hardware	Various Locations

3.2 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials.

B. During the entire construction period of the project, if snow and freezing weather occurs, the General Contractor shall remove snow and ice from building work areas as may be required for the protection of the work and not delay the progress of the work.

C. The General Contractor shall provide all snow plowing and snow removal required to keep all temporary roads, staging areas, office trailer staging area, walks and access ways free from snow and ice so that free unimpeded access to and within staging areas for work of the project are

maintained for all project personnel. Each prime contractor is responsible for clearing snow for pathway to office trailer entrance.

3.3 INSTALLATION, GENERAL

A. Locate facilities where they will serve project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required by progress of the work.
   1. Locate facilities to limit site disturbance as specified in Section 011000, "Summary of Work."
   2. Coordinate location(s) with the Owner, Architect and Construction Manager.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify facility as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities. Locate facilities where they will serve project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required by progress of work.

C. Lifts and Hoists: Each Prime Contractor shall provide facilities for hoisting materials, equipment and employees in the advancement of the project. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

D. Shoring: Each Prime Contractor shall provide all shoring necessary for the advancement of the project. The work shall comply with all safety laws and be constructed so as not to interfere with other work. Coordinate with all other contractors.

3.4 PROTECTION OF BUILDING OCCUPANTS

A. The requirements of Section 155 of the Regulations of the New York State Commissioner of Education apply to the project.

B. Owner occupied areas of the building shall always comply with the minimum requirements necessary to maintain a Certificate of Occupancy.

C. General safety and security standards for this project include:
   1. All construction materials shall be stored in a safe and secure manner.
   2. Fences around construction supplies or debris shall be maintained.
   3. Gates in temporary fences shall always be locked unless a worker is in attendance to prevent unauthorized entry to the contract areas. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
   4. Workers shall always wear photo-identification badges for identification and security purposes.

D. Separation of Construction Areas:
   1. At minimum, temporary walls shall be constructed as part of the base bid by the General Contractor. These walls shall go from floor to roof deck to separate construction activities at the following locations:

a. Description (if applicable)
b. What is the wall construction type?

2. Construction areas which are under the control of a contractor and therefore not occupied by District Staff or Students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barrier must be made to prevent exposure to dust and contaminants. Each Contractor working inside the buildings shall temporarily seal doorways enclosing their work area, using heavy duty plastic, duct tape, etc. Repairs of the plastic and tape must be made in the event the tape becomes loose or the plastic is cut or torn.
3. Gypsum board shall be used in exit ways or other areas which require fire-rated separation.
4. Plastic sheeting may be used only as a vapor, fine dust, or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.
5. In general, workers may not use corridors designated for students or school staff use.
6. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building. No material shall be dropped or thrown outside the walls of the building.
7. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety, and educational capabilities all times classes are in session.

E. Fire and Hazard Prevention: Areas of buildings under construction that are to remain occupied shall maintain a Certificate of Occupancy.
1. No smoking is permitted on school property, including construction areas.
2. Do not block fire exits or emergency egress windows with construction materials, equipment, or debris.
3. All Prime Contractors and their subcontractors are required to notify the General Contractor and Construction Manager of any hazard and stop work until the hazard is resolved.
4. Each Contractor shall seal penetrations they make in floors or walls with fire-resistant material.
5. Each Contractor shall cover temporary openings to prevent accidents and to stop the possible spread of spilled liquids, construction dust, or fire.
    a. If any opening presenting a hazard is not protected and a contractor has not claimed responsibility, the Construction Manager will direct the General Contractor to protect the opening. Costs will be split equally between the Prime Contractors working in the area. Prime Contractors are encouraged to coordinate and cooperate. Construction Manager's decision is final.

F. Noise Abatement During Construction:
1. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building is not occupied, or acoustical abatement measures shall be taken.

G. Control of Airborne Contaminates During Construction:
1. Each Contractor shall be responsible for the control of his chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc.

to ensure they do not enter occupied portions of the building or air intakes. All diesel engines shall be equipped with catalytic converters to minimize smoke and fumes.

2. The General Contractor shall provide temporary filters over all outside air intakes within 100 feet of any site construction. Filters shall be cleaned every 3 months.
3. Each Contractor shall be responsible to ensure that his activities and materials which result in off-gassing of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured, or ventilated in accordance with manufacturer's recommendations before a space can be occupied.

3.5 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for a time when service can be interrupted (if necessary) to make connections for temporary services. Where the utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
   2. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by Authorities Having Jurisdiction.

3.6 WATER SERVICE

A. Each prime contractor is responsible to connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

B. Each contractor shall make arrangements with Owner for the use of water during construction. Provide and maintain water hydrant connected to existing water supply throughout construction.

C. From the source of supply, provide all temporary connections, lines, hose, pipe, barrels, and all other parts and pay all costs for same and shall run temporary lines to each area of the work where water is required. Practice prudent conservation of water. No leaking hoses or connections will be tolerated.

3.7 SANITARY FACILITIES

A. Sanitary Facilities: The general Contractor shall provide temporary toilets and wash facilities for use of construction personnel at the Gillette Rd location. All prime contractors will supply temporary toilets at all other locations. Comply with requirements of Authorities Having Jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Site contractor shall supply their own sanitary facilities.

B. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs. Coordinate locations with Owner's representative.
   1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used materials.
   2. The area of sanitary facilities shall not be used for loitering and shall be kept clean by the Contractors.

C. Toilets: Self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
   1. Provide separate facilities for male and female personnel.

3.8 TEMPORARY HEATING, COOLING AND VENTILATION

A. Temporary Heating and Cooling: The General Contractor shall provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
   1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels required to allow installation or application of finishes and their proper curing or drying.
   2. The General Contractor is responsible to provide heat for the buildings from November 1 until May 15.

B. Temperatures shall be maintained in areas of the building as specified in the various Specification Sections, but not less than 55°F. Under no circumstances shall the temperature reach a level which will cause damage to any portion of the work. Temperature shall be always maintained, both during and after normal working hours.

C. Responsibility for Job Conditions and Damages: a tight temporary building enclosure shall always be maintained. The temporary heating and cooling operations shall be so conducted as to protect work which could be damaged. Provide suitable heating capacity to offset both heat losses from incoming ventilation air and natural transmission heat losses.

D. Temporary heating before use of permanent system or when permanent systems cannot be used for temporary heat shall be provided by the Contractor responsible in the following manner:
   1. Provide and maintain a system of gas heaters as required to maintain temperatures as described herein for all Contractors and trades.
   2. Pay for maintenance and attendance required in connection with temporary gas heating system. Provide connections and temporary transport lines as required to distribute temporary heat throughout building.
   3. Replace or refinish any surface damaged by use of the temporary gas heating system.
   4. Provide safety precautions and features including suitable fire extinguishers.
   5. Use of electric heaters will not be allowed for temporary heat.

E. Isolation of Work Areas in Occupied Facilities: Each Contractor shall prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, the HVAC contractor shall isolate the HVAC system in areas where work is to be performed.
      a. The HVAC contractor shall disconnect supply and return ductwork in work areas from HVAC systems servicing occupied areas.
      b. Each Contractor shall maintain negative air pressure within work areas using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

F. After Substantial Completion of the building and mechanical/electrical systems, the Owner shall assume the responsibility for operating the heating, ventilating and air conditioning systems and assume the cost of gas, hot water, electricity and attendance.

G. Completion and Removal of Equipment: Remove all temporary piping, heating or cooling units, connections and other equipment installed upon conclusion of the temporary heat/cooling period and pay all costs in connection with repairing any damage caused by the installation or removal of temporary equipment and shall clean and recondition those parts of the permanent heating and ventilations systems used for temporary service.

3.9 TEMPORARY ELECTRIC SERVICE

A. Each Prime contractor shall be responsible for temporary electric, phone and internet service to their office trailer.

B. Provide the following panels and branch circuit:
   1. The Electrical Contractor shall provide temporary power throughout the construction areas as required to facilitate construction operations. Minimally, provide individual 120/240 volt/single phase/200-amp feeders and branch circuit panel boards throughout the building. Feed panels from existing MDP and space temporary panels to allow branch circuit wiring to receptacle to be one hundred feet (100') or less to the furthest receptacle. Provide receptacle distribution boards every fifty feet. Distribution board shall have four (4) four square boxes with two (2) duplex receptacles per box. Each 4 square box shall have one (1) 20-amp circuit.
   2. Temporary services shall be operational seven (7) days a week, 24 hours per day, maintained during all work periods and shall comply with all codes and regulations.
   3. Relocation of the temporary electrical system shall be by the Electrical contractor as directed by the Owner's project representative. Removal of the entire temporary electrical system shall be by the electrical contractor.

4. Branch Circuit wiring and control wiring to temporary heating systems shall be by the electrical contractor. Control wiring shall be kept to the simplest automated form (i.e., T-stat or time clock).
5. Welding equipment shall run from generator trucks unless authorized by the Owner's project representative.
6. Fan Rooms and windowless areas, etc., shall be provided with lamp holders and outlets as required for construction purposes, and installation of mechanical equipment, three circuits maximum required.
7. Three (3) 60 ampere, 208-volt, three phase, three wire power circuits where required for heavy duty power tools. Provide all disconnects and make connections to equipment as required. Provide warning signs at power outlets other than 110V to 120V.
8. Feeder wiring and branch circuit wiring shall be sized to limit the voltage drop to 5% at the extreme end of any branch circuit run.
9. Install and maintain wiring clear of normal traffic flow and out of way of the General Construction work.
10. Provide metal conduit, tubing or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
11. Green grounding wire, sized according to code, shall be installed with each feeder and outlet branch circuit. All outlets shall be grounded through the equipment grounding wire. Provide ground at main load center according to code.

C. Provide temporary dry type transformers to step down voltage to 208/120V in the power plant. Verify location with Owner.

D. Each Prime Contractor shall connect to Owner's existing electric service to facilitate work of their contract.

E. Welding equipment shall run from generator trucks unless authorized but the Owner's project representative. (Each Prime is responsible for welding equipment necessary to complete contract work.)

F. The Electrical Contractor shall provide portable generators to power equipment within building during electrical service change outs. At minimum, the Network Operating Center shall be maintained during all power outages. Additional equipment may need to be maintained depending on schedule and duration of outage. Coordinate all District requirements and provide temporary service as required.

G. The Electrical Contractor shall provide up to five (5) separate temporary connections (tie-ins) of equipment to facilitate abatement operations.

H. The Electrical Contractor shall provide up to five (5) separate temporary connections (tie-ins), of equipment to facilitate flooring operations.

I. Lighting: The Electrical Contractor shall provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

2. Provide temporary lighting in corridors equivalent to the foot-candle rating of the existing fixtures. Maintain fixtures and lamps until new ceilings and fixtures are installed and operational.
3. Maintain exit lighting through-out construction until new exit lighting becomes fully operational.
4. Provide and maintain temporary lighting at all construction areas. The light levels shall be maintained at a minimum of 10-foot candles.

J. Lamps, extension cords, etc. shall be furnished by separate Prime Contractor and sub-contractors desiring these items.

K. When need for temporary service has ceased, and when directed by the Architect, the contractor shall notify the Owner and shall remove the temporary wiring system.

3.10 FIRE ALARM SERVICE

A. As directed by the CM, the Electrical Contractor shall be responsible to remove, relocate and reprogram all existing to remain smoke or heat detectors as needed. The Electrical Contractor shall be compensated for this work by the use of CM directed man hours.

B. As directed by the CM, the Electrical Contractor shall clean all existing to remain smoke and heat detectors prior to final turnover. The Electrical Contractor shall be compensated for this work by the use of CM directed man hours.

3.11 TEMPORARY ISOLATION VALVES

A. HVAC Contractor shall provide in base bid the labor and material required to install (4) isolation valves for pipe sizes 3/4", 1", 1 1/2", and 2". Include temporary measures required to install isolation valves (i.e., freeze kit) as required. Installation of these valves shall be as directed by the Owner's representative.

B. Plumbing Contractor shall provide in base bid the labor and material required to install (4) isolation valves for pipe sizes 3/4", 1", 1 1/2", and 2". Include temporary measures required to install isolation valves (i.e., freeze kit) as required. Installation of these valves shall be as directed by the Owner's representative.

C. The HVAC Contractor shall be required to drain, fill and vent systems as many times as required to facilitate work of this contract with no additional cost to the Owner.

D. The HVAC Contractor is to make as many trips as required based on project phasing to perform contract balancing, including balancing requirements during the commissioning process, at no additional cost to the Owner.

3.12 TEMPORARY TELEPHONE/DATA NETWORK/PUBLIC ADDRESS SERVICES

A. Telephone Service: Prime Contractors are responsible for their own data, fax and telephone lines to their respective office locations.
   1. At each telephone, post a list of important telephone numbers.
      a. Police and Fire Departments
      b. Ambulance Service
      c. Contractors' Home Offices
      d. Contractors' emergency, after-hours telephone numbers
      e. Architect's Office
      f. Construction Manager's Office
      g. Engineer's Office
      h. Owner's Office (Principal's Office at each building/location)
      i. Principal subcontractors' field and home offices

B. Each Prime Contractor to provide portable cellular telephone with voicemail for Superintendent's use in making and receiving telephone calls when away from the field office.

C. Prime Contractor shall authorize his job foremen to make all necessary telephone calls required to expedite the job and at the Prime Contractor's expense.

3.13 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is non-combustible according to ASTM E 136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits.
   1. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.
   2. GC to sweep temporary roads and existing parking areas daily as required. Site contractor to complete this at the Gillette Road Site.

C. Temporary use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."

3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

D. Traffic Controls: Comply with requirements of Authorities Having Jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

F. Contractor providing roof opening shall be responsible to enclose opening with framing, plywood and EPDM until roof top equipment is placed. Removal and disposal to dumpster by contractor placing permanent equipment.

G. General Construction Contractor shall be responsible for all temporary doors and locks. Provide keyed locks and provide each contract a key. Provide twenty-four (24) keys to the Owner's Project representative.

H. Contractors shall provide minimum of one (1) 40' Averdi storage container for materials, tools and equipment at the designated staging area. Materials shall be brought into the building as needed. Storage in the boiler room, mechanical spaces and school storage rooms and closets will not be allowed.

I. Prime contractors or subcontractors may erect temporary buildings for the storage of materials and equipment. Heat, light and power (if required) for temporary buildings is the responsibility of the Prime contractor or subcontractor erecting each temporary building.

J. Materials shall not be stored promiscuously about the site but shall be carefully stored in areas which will not interfere with pedestrian traffic nor with access to and egress from adjacent properties and buildings.

3.14 PUMPING AND DRAINING

A. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 31. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

B. Comply with requirements of Authorities Having Jurisdiction. Maintain project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding project or adjoining properties or endanger permanent work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

C. Each Prime Contractor shall keep excavations and other project related work areas free from water at all times. Pump or drain, as necessary. Distribute discharge to prevent excessive erosion and damage to surrounding areas.

D. The Plumbing Contractor is responsible to furnish and install all materials necessary to temporarily drain new roofs directly after the membrane is installed or at the direction of the Construction Manager. The Plumbing Contractor is responsible to maintain the existing roof drain systems affected by addition and renovation construction work.

3.15 PROJECT SIGNS

A. Prime Contractors shall install approved signs as necessary for safety and, as necessary, to meet insurance requirements.

B. The General Contractor shall provide signs to reroute traffic and warn the public of construction zones at all locations. Site contractor will complete this at the Gillette Road location.

C. No other signs shall be erected on the grounds or on the building except as may be expressly authorized by the Owner and Architect.

3.16 CLEANUP AND WASTE DISPOSAL

A. General: the premises and the job site shall be maintained in a reasonably neat and orderly condition and kept free from accumulations of waste materials and rubbish during the entire construction period. Remove all crates, cartons and other flammable waste materials or trash from the work areas at the end of each working day.
   1. The General Contractor will supply dumpsters for use by all Prime Contractors at the Gillette RD location, except Site and Abatement Contractors. Each Prime contractor shall provide dumpsters for their and their subcontractors own use at all other locations.
   2. Cleaning operations for all Contractors shall be as follows:
      a. Cleaning operations are required daily by each Contractor. Each contractor shall be responsible for the cleaning of their work areas and all subcontractors' work areas daily.
      b. If the premises and job site are not maintained properly, the Owner may have any accumulations of waste materials or trash removed and charge such cost to the Contractor.

B. Each Prime Contractor shall provide one (1) man for four (4) hours every Friday for a project wide cleanup. Individual assigned shall actively participate. A lackadaisical effort or failure to provide a man to participate will result in a back charge of $400 weekly. Labor force will work under the direction of the Construction Manager. At the end of the 4-hour cleanup, the General Contractor shall be responsible to broom clean the entire site. Utilize sweeping compound at all times. (This work is in addition to the labor hours called out in Specification Section 011000)
   1. Cleaning of specific work areas outside the phased construction area shall be by Contractor responsible for the mess.

2. Cleaning of rooms/spaces for District Occupancy shall be the General Contractor even if occupancy is only temporary.
3. The General Contractor shall provide a professional cleaning company to final clean each space upon Substantial Completion.

C. All areas inside and outside the work area shall be cleaned and left free from rubbish, mortar drippings, extraneous construction materials, dirt and dust. Clean up areas within the contract limits, and keep areas adjoining the construction site, such as streets, driveways, walkways, etc., clean and free from debris, mud, etc., which was generated from the construction site.

D. All rubbish shall be lowered by way of chutes or lowered in receptacles. Under no circumstances shall any rubbish or waste be dropped or thrown from one level to another within or outside the building.

E. Damage to Existing Surfaces: Care shall be taken by workmen not to mark, soil, or otherwise deface any finished surfaces. In the event that any finished surface becomes defaced in any way, the Contractor causing damage shall be responsible for cleaning and restoring such surfaces to their original condition.

F. Clean up immediately upon completion of each trades work.

G. The Mechanical, Plumbing, and Electrical Contractors shall, on completion, clean all exposed piping, pipe fin radiation, convector and air conditioning equipment, fixtures, motors, fans, ducts, panel boards and all other parts of their work and leave same free of all dirt, oil, dust, etc.

H. Collection and Disposal of Waste: Each Prime contractor shall collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in lawful manner.

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of Authorities Having Jurisdiction.

3.17 SCAFFOLDING AND HOISTING, GENERAL

A. Prime Contractors shall provide all scaffolds, runways, ramps, ladders, hoists and other construction aids as may be required for reaching all portions of his work conveniently and safely, except as otherwise indicated.

B. Prime Contractors shall furnish and maintain all temporary ladders, ramps, runways, chutes, derricks, stairs, joists, cranes and similar items required for the proper execution of the work of the Contract, including the work of subcontractors. Any and all of these facilities shall be constructed so as to prevent damage to, including staining or marring of, permanent work and existing to remaining work and building components. All damage resulting from the use of such facilities shall be repaired by the contractor at his expense.

1. Where chute operation is performed adjacent to areas occupied by the public in which there are wall openings, i.e.., windows, doors, etc., such opening shall be protected against penetration to withstand the maximum credible impact.

C. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

D. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

E. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs protected and are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

F. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.18 MATERIAL HOIST

A. The Contractor who provides a material hoist of any type is responsible for assuring that personnel and the public is in no way put at risk by the operations.

3.19 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
   1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 011000, "Summary".

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion and sedimentation control Drawings or Authorities Having Jurisdiction, whichever is more stringent.

1. Comply with Authorities Having Jurisdiction and requirements specified in Division 31 Section, "Site Cleaning".
2. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree-or-plant-protection zones.
3. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
4. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from project site during the course of the project.
5. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of Authorities of Having Jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

3.20 BARRICADES AND PROTECTION

A. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
   1. Roadways, walks, paths, exit was and other areas, etc. shall remain unobstructed and shall be maintained in a safe and satisfactory manner by the Contractor.
   2. Contractors shall properly barricade all of his excavations, trenches, dangerous openings and other parts to prevent injury or harm to any person in such areas. Excavations and trenches must be covered and temporarily paved for traffic and snow removal operations during winter months.
   3. All guards and night lights and other proper protection shall be provided by Contractors, for the safety of the public, occupants of adjacent buildings and areas and employees and staff of the Owner as may be required by the Owner and all Authorities Having Jurisdiction.

B. Each Contractor shall provide and maintain such temporary work as may be required for the protection of new and existing work where liable to injury, including building paper and plank for floors and treads, and boxing for jambs, sills, projecting courses and such other work. Materials or methods which stain or damage finished work shall not be used.
   1. Each contractor working over finished surfaces such as, but not limited to flooring, casework, countertops and bathroom fixtures shall be responsible to protect the finished surfaces.
   2. Any contractor that causes damages to finished surfaces will be liable for the replacement cost.

C. The General Contractor shall be responsible for and shall protect all trees, shrubs, lawns and other Site work property damage by operations of this project where such items are to remain. The Site contractor will perform this work at the Gillette Rd. project.
   1. Install temporary fencing located as indicated or outside the dip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding and erosion.

D. Enclosure Fence: Each Contractor shall provide temporary protective fencing around staging and construction areas for the protection of equipment and materials as required to facilitate construction.
   1. Fence shall be a substantial heavy-duty chain-link type of fence six-feet high (6'-0"). Provide entrance gates and doors of similar chain- link construction, with location as approved by the Owner, with locking hardware and with sizes as required for admitting construction personnel, vehicles, and equipment. The fence shall be maintained in good repair at all times while it remains in place at the project site. A well painted or well galvanized appearance will be required at all times with no rusty areas. The fence shall be removed when it is no longer required and as directed by the CM. Fence shall become the property of the Contractor after removal from the Site.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one (1) set of keys.

E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
   1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

F. Dust Tight Partitions: Each contractor shall furnish and install dust tight partitions made of gypsum board, metal studs or other approved materials at any location as may be required to prevent dust and dirt from traversing into occupied areas of the existing building unless specifically called out to be provided by the GC.
   1. Furnish and install dust partitions in all areas where alterations occur in such manner as to allow clean, continuous service to the existing facilities. Locations of such partitions shall be agreed to by the Owner and the Architect.
   2. Provide temporary doors in partitions as required. Install approved materials to act as framing at all four sides of each door. Provide hardware for the doors as required. Provide automatic closers on all such doors. Temporary partitions are to be removed from the premises when directed. Any damage to walls, base, floors, ceilings caused by installation of temporary partitions shall be properly repaired to satisfaction of the Architect at the expense of the GC.
   3. Partitions shall have all joints at floors, walls and ceilings taped securely and with weather-stripping and proper "sweeps" at doors, all to prevent dust entering adjacent occupied or finished areas.
   4. Where fire-resistance-rated temporary partitions are indicated or are required by Authorities Having Jurisdiction, construct partitions according to the rated assemblies.
   5. Insulate partitions to control noise transmission to occupied areas.
   6. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
   7. Protect air-handling equipment.
   8. Provide walk-off mats at each entrance through temporary partition.

G. Environmental Protection: provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

H. Pest Control: engage pest control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so the project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully using materials approved by Authorities Having Jurisdiction.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by Authorities Having Jurisdiction.

J. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of Authorities Having Jurisdiction.
   1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   2. Paint and maintain appearance of walkway for duration of the work.

K. Temporary Enclosures: Each Contractor shall provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. The General Contractor shall provide temporary, weather-tight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

3.21 TEMPORARY FIRE PROTECTION

A. Fire Protection Program: Each Prime Contractor shall be responsible for the development of a fire protection and prevention program to be followed throughout all phases of the construction and demolition work, and he shall provide for the firefighting methods and equipment as required for all Contractors and employees for the project. The program shall be in compliance with OSHA Construction Safety and Health Regulations as stated in the Federal Register dated June 24,1974, Volume 39, Number 122, Part II, Subparagraph F and any amendments or any updating thereof and any more stringent requirements by local governing bodies. There shall be no delay in providing the necessary equipment. Some conditions of the program are as follows:
   1. Provide an approved fire permit procedure with active procedure signoffs.
   2. Prohibit smoking.
   3. Maintain unobstructed access at all times to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell. All firefighting equipment provided shall be conspicuously located.
    a. Each office trailer shall be equipped with a fire extinguisher.
5. All firefighting equipment shall be inspected and maintained in operating condition.
6. Fire extinguishers, water drums and other equipment, subject to freezing, shall be protected from freezing.
7. Store combustible materials in containers in fire-safe locations.
8. Prime Contractors to provide supervision of their own welding operations, combustion type temporary heating units, and similar sources of fire ignition.
9. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
10. Regardless of any conditions stated above, the General Contractor shall provide appropriate fire extinguishers for use by all persons employed on the project who are using equipment that constitute a fire hazard such as welding and he shall provide accessible appropriate fire extinguishers withing fifty (50) feet of wherever combustible or flammable liquids or gases are being used or stored on the job site.

B. Each Prime Contractor shall provide a non-working fire watch for any spark or flame producing activity. Fire watch shall remain in the immediate area of the activity after cessation of activity for a minimum of Two (2) hours. Provide multiple fire watch personnel when more than on operation is underway or when multiple levels require a fire watch. Provide (minimum) of one (1) roving fire watch after the activity. Each fire watch shall have immediate access to a fire extinguisher. Provide fire blankets as required.
    1. Document this activity in the form of an approved fire permit with active procedure signoffs. Develop and supervise an overall fire-prevention and first-aid fire protection program for personnel at project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information and coordinate with other Contractors.

C. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

D. Permanent Fire Protection: at the earliest feasible date in each area of the project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

3.22 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed work, and replacing water-damaged work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers, but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard and replace stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
   3. Comply with manufacturer's written instructions for temperature relative humidity, and exposure to water limits.
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 24 hours are considered defective and require replacing.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 24 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 24 hours.

3.23 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipling in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Unless the Architect requests that it be maintained longer remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of contractor unless otherwise specified. Owner reserves right to take possession of project identification signs.
   2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair grown of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by Authorities Having Jurisdiction.
   3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section, "Project Closeout."

SECTION 016000 - NYSED UNIFORM SAFETY STANDARDS FOR SCHOOL CONSTRUCTION (SECTION 155.5 REGULATIONS)

PART 1 - GENERAL

A. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

B. All school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos.

C. General safety and security standards for construction projects:

1. All construction materials shall be stored in a safe and secure manner.

2. Fences around construction supplies or debris shall be maintained.

3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.

4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.

5. Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites.

6. No tobacco use is permitted on school property, including construction areas.

7. Do not block fire exits or emergency egress windows with construction materials, equipment, or debris.

8. Each Contractor shall seal penetrations they make in floors or walls with fire resistant material.

9. Each Contractor shall cover temporary openings to prevent accidents, and to stop the possible spread of spilled liquids, construction dust, or fire.

D. Separation of construction areas from occupied spaces:

1. Construction areas, which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and containments into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or containments. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheathing may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.

2. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.

3. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

4. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

E. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken.

F. The contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline, or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes.

G. The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied.

H. Adequate Ventilation During construction: Maintain existing ventilation systems in full functional operation in all areas of the building that are to be occupied during construction periods. No work shall be performed on systems serving occupied areas. Coordinate and schedule work on such systems with Owner to allow relocation of program activities prior to construction.

I. Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied. Note, it is our interpretation that the term "building," as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.

J. Exterior work such as roofing, flashing siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.

K. Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions of occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

END OF SECTION 016000

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies the requirements for cutting, patching, demolition and alteration work without limiting the generality implied by the Specifications and Drawings.

B. Related Sections include the following:

1. Division 01 Section "Selective Structure Demolition" for demolition of selected portions of the building.

2. Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

C. Work of this Section applies to the Prime Contractor and subcontractors. Prime Contractor and subcontractor shall provide required labor, materials, and equipment for the cutting, patching, and alteration work shown, specified, and as necessary to complete the work of their trades. The work under this Section shall include but is not limited to the following principal items.

D. It is the intent, of this Specification Section, that each Prime Contractor perform the cutting and patching for their respective work on the project, and to the extent describe below. The Contractor shall be responsible to review all the Contract Drawing for all trades to determine the extent of the cutting and patching that is required.

1. Demolition, Cutting and Patching as indicated and as necessary to install new work in alteration/renovation areas of the existing building as indicated.

2. Salvage of Materials for reuse in the project, where indicated and salvage and delivery of specific items to Owner for his use where indicated, or for use by Prime Contractor and subcontractor for work of their trades as directed. The following materials/systems which are not specifically noted on the drawings for reuse in the project, shall be carefully removed and delivered to the Owner's Representative on the premises where directed except such items as the Owner may declare to be the Contractor's property to be legally disposed of off the Site by the Contractor.

3. Each Contractor shall not damage or endanger any portion of the work or the work of the Owner or any separate Contractors by cutting, patching or otherwise altering any work or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate Contractor except with the written consent of the Owner and of such separate Contractor. The Contractor shall not unreasonably withhold from the Owner or any separate Contractor his consent to cutting or otherwise altering the work.

4. General Construction Contractor shall add, build, demolish, relocate, remove, reinstall, patch and finish such walls, ceilings, partitions, structural work, equipment work, finish work, and other General Construction Work necessary to complete the Work.

    a. The General Construction Contractor shall provide for the drilling of steel structural components that are required to for pipes or conduits to pass through. Only after the approval of the Architect and Structural Engineer.

5. HVAC Contractor shall properly disconnect, terminate, demolish, alter, relocate, replace, reconnect, and add to as indicated and required to complete the work. The contractor shall furnish and install new heating equipment, piping, valves, controls, etc., as required.

6. Plumbing Contractor shall properly disconnect, terminate, demolish, alter, relocate, replace, reconnect, and add to as indicated and required to complete the work. The contractor shall furnish and install new fixtures, piping, valves, controls, etc. as required.

7. Electrical Contractor shall properly disconnect, terminate, demolish, alter, relocate, replace, reconnect, and add to as indicated and required to complete the work. The contractor shall furnish and install new fixtures, wiring, panels, switches, etc. as required.

8. Any and all holes cut or materials disturbed in existing or new partitions, walls, floor, deck, ceiling, etc., whether exposed or concealed, shall be patched and sealed around penetrating items with construction equal to existing and to maintain the appropriate fire/smoke barrier. Coordinate with Owner as to location and type of existing barriers.

E. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23, and 26 for other requirements and limitations applicable to cutting and patching plumbing, mechanical and electrical installations.

2. See Division 02 Sections for specific requirements relating to the removal of asbestos containing materials (ACM) and other environmental conditions.

3. See Division 7 Section for patching fire rated construction.

F. Work Not Included: Moving loose equipment, furniture, furnishings, utensils and supplies except as specifically specified otherwise.

1.3 DEFINITIONS

A. Cutting and patching covers adjustments to, and necessary reworking of, elements of construction in both new and existing work. The following definitions for cutting and patching apply to this Contract.

1. Cutting: Physical modification of construction work, both new and existing, or removal of existing or installed materials, including excavating and earthwork.

2. Patching: Restoration or replacement and installation of construction material, both new and existing, including finishing, patching, excavations and compaction of backfilling.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures 10 days prior to when cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Prior to cutting which affects structural safety of project, submit written notice to the **Architect and Construction Manager** requesting consent to proceed with cutting, including:

a. Identification of project.

b. Description of affected work.

c. Necessity for cutting.

d. Affect on other work and on structural integrity of project.

e. Description of proposed work. Designate:

1) Scope of cutting and patching.

2) Contractor and trades to execute work.

3) Products proposed to be used.

4) Extent of refinishing.

f. Alternatives to cutting and patching

g. Designation of party responsible for cost of cutting and patching.

7. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

8. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

B. Provide samples of material finish or color for Architect’s approval.

C. Other Submittals shall be as specified in the respective specification sections for each similar material or trade.

1.5 QUALITY ASSURANCE

A. General: Structural and other conditions shall be verified with the Architect before proceeding with cutting, demolition and alterations work. Inspect structures prior to start of Work and notify the Architect in writing of any conditions detrimental to the execution of the Work.

B. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

C. Operational and Safety Limitations: Do not cut and patch the following operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire protection systems.

4. Control systems.

5. Communication systems.

6. Conveying systems.

7. Electrical wiring systems.

8. Operating systems of special construction in Division 13 Sections.

9. <Insert other operating system.>

D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work that is cut and patched in a visually unsatisfactory manner.

E. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.

2. Membranes and flashings.

3. Exterior curtain wall construction.

4. Equipment supports.

5. Piping, ductwork, vessels, and equipment.

6. Noise and vibration control elements and systems.

7. <Insert other operating system.>

F. Engage recognized, experienced, and specialized firm for installation or fabrication of the following:

1. Processed concrete finishes.

2. Stonework and stone masonry.

3. Ornamental metal.

4. Matched veneer woodwork.

5. Preformed metal panels.

6. Roofing.

7. Fire stopping.

8. Window wall system.

9. Stucco and ornamental plaster.

10. Terrazzo.

11. Finished wood flooring.

12. Fluid applied flooring.

13. Aggregate wall coating.

14. Wall covering.

15. Swimming pool finishes.

16. HVAC enclosures, cabinets, or covers.

17. <Insert other operating system.>

G. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential

interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for each trade or specialty involved in alterations, cutting, and patching shall be furnished and installed as specified in the respective specification sections or as specifically indicated on the drawings.

B. Where materials and installation are required but not specified, use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

1. Do not use asbestos containing materials.

2. Do not use lead based paints.

C. Supplement relocated materials where required to complete Work of the project, with similar materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Notify Architect in writing and take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Photograph existing damage, which could be misconstrued as damage resulting from the Work of this Contract. State location and date of photograph and file with the Architect prior to starting work.

2. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict and coordinate procedures before proceeding.

B. Acceptance: Proceeding with the Work shall be evidence of acceptance of job conditions.

C. Where unanticipated mechanical, electrical or structural elements which conflict with the intended function of the design are encountered, Contractors shall investigate and measure the nature and extent of the conflict. Report this to the Architect in written, accurate detail, and pending receipt of the Architect’s decision, rearrange construction schedule as necessary to continue overall job progress without delay.

D. Contractors are hereby notified that asbestos containing materials (ACM) are present in the building. No asbestos shall be disturbed throughout the work except by licensed asbestos contractors retained for this purpose, in accordance with the Contract Documents. All Contractors and subcontractors shall review available documentation concerning types and locations of ACM prior to disturbing, damaging or removing materials, which could contain asbestos. Requests for clarification regarding the asbestos content of specific materials should be transmitted in writing to the Architect.

E. Contractors and subcontractors shall assume that lead based paint is present on the surfaces of the building materials throughout the building. Each contractor shall provide protection of workers and the public to prevent the discharge of paint chips, dust, or other hazardous materials into the soil, water, or air. Lead contaminated waste shall be collected daily and stored in securely covered hard wall containers. The contractor shall collect representative samples of the waste and have samples analyzed per Resource Conservation and Recovery Act (RCRA) hazardous waste criteria. Testing shall include Toxicity Characteristics Leaching Procedure (TCLP). Sampling methods and quantities shall be in accordance with United States Environmental Protection Agency (EPA) approved standards. The contractor shall store, stabilize, transport and dispose of all residuals and waste in accordance with all applicable state and federal regulations within 45 days of completion of the removal operation.

1. The General Contractor shall prepare, submit, and pay all fees associated with any permits, certifications, or manifests required for storage, transportation and disposal of residual and waste, including obtaining a Temporary Waste Generator Identification Number, if required. Copies of all transportation manifests and certification of final disposal shall be submitted to the Owner within 10 days of final disposal.

2. Secured roll-off containers shall be acceptable for storage of demolition debris, which includes paint assumed to contain lead. At a minimum, one TCLP analysis of a sample of each general type of construction debris which includes paint shall be performed.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction to remain, including structural systems, equipment, flooring and finishes during cutting and patching to prevent damage. Provide protective covering for existing finished surfaces to remain and protect existing construction from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

1. Prime Contractor shall repair existing finishes and other construction damaged by work of his forces or his subcontractors as approved by the Architect and at no additional cost to the Owner.

2. The General Construction Contractor shall cover and protect furniture, equipment, etc., not being used, in rooms where furniture and equipment will remain during Contractors working hours.

3. Contractors shall protect and maintain all conduits, drains, piping, heating systems wiring, etc. that will remain, where encountered.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

1. Security and Access: The security and maintenance of adequate safe means of egress and ingress to the existing building is of prime importance from the standpoint of maintaining the building and its operation at all times and shall be the responsibility of the Contractors performing their respective Work. Contractor shall coordinate work with the Owner, and all concerned. All entrances and exits shall remain accessible at all times.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Comply with the applicable Sections of the Specifications for similar work except as specifically indicated otherwise.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Timing: Coordinate Work to facilitate scheduling of abandonment and to allow for the installation of temporary and permanent services as required. All Work shall be scheduled in advance at a meeting with the Owner, Architects and Contractor to provide as little interference as possible with the operation of the existing facilities. Where required, Overtime (Premium Time) Work shall be furnished as specified in Division 01, Section 012100 “Allowances”.

C. Manner: The work shall be executed when directed by the Owner in an orderly and careful manner with due consideration for inhabitants and the public.

D. Maintain enclosures at all openings to adjacent occupied areas not being altered, at all times, with necessary signs, lights, bracing and guards for the protection of all personnel, existing facilities and to comply with governing fire codes.

E. Cutting and Patching Work shall be completed in a manner which will prevent the seepage of dust and debris into adjacent occupied areas not being altered. The General Construction Contractor shall sprinkle where necessary and possible to lay the dust and provide closures as specified in Temporary Facilities Section.

F. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

G. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

a. Where patching occurs in a smooth painted surface, extend two finish paint coats over entire unbroken surface containing the patch, after the patched area has received primer coat. Terminate painting at the nearest logical stopping point, i.e., a wall break, or to a corner.

4. Patch, repair or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.4 CLEANING

A. Daily cleaning of alteration areas of the building shall be the responsibility of the General Construction Contractor.

B. Thoroughly clean areas and spaces where cutting and patching is performed, or used as access, to the satisfaction of the Owner and the Architect. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

C. Demolished Materials: Except as specified or shown otherwise, all work demolished shall become the property of the General Construction Contractor and shall be removed from the project site at frequent intervals. Piles of demolished materials will not be allowed to accumulate.

D. The General Construction Contractor shall legally dispose of, off the project site, all materials removed that will not be reused in the project or indicated to be returned to Owner.

3.5 SPECIFIC ITEMS OF WORK INCLUDED

A. Prepare floors for installation of finish materials. Fill all voids, openings and irregular surfaces. All voids and openings are to be patched or closed to comply with appropriate fire-rating and structural details. Flash patch existing surfaces with approved products as required to permit installation of new finishes. The floor within each room is to be level and true either by removing raised areas or infilling as may be required. Intent is to maintain typical existing floor elevation throughout.

A. In areas other than within the main areas of work, the respective subcontractor is to rough patch and finish patch all disturbed ceilings, floors, bases and walls to match existing in Owner occupied and Owner unoccupied areas. See University of Rochester General Conditions of the Contract for Construction, Cutting and Patching.

B. All existing and new surfaces are to be prepared to receive new finishes, including finish patching of new and existing holes, voids, cracks, etc.

C. The General Contractor is to remove and reinstall or replace existing drywall, plaster, acoustical tile or metal tile ceilings that are disturbed for the completion of new work on floors above or adjacent to the work area. Existing ceilings to be refinished are to include entire ceiling area of room to insure consistent color and sheen. Existing ceilings damaged by the contractor and that cannot be reinstalled in an acceptable manner will be required to be replaced at the Contractor's expense, including light fixtures, grilles, interior decor and associated accessories. All replacement ceilings and parts are subject to the Owner's approval prior to installation.

D. Where new equipment projects below an existing ceiling line, the ceiling area disturbed is to be reinstalled or replaced to be below the new equipment. However, the Contractor is to notify the Owner's Representative before beginning work associated with the installation of the new equipment and proceed with the work only after the Owner's approval is given.

E. The General Contractor is to close, rough patch and finish patch all openings, chips, irregular surfaces, electrical junction box pockets, cut off pipe hanger, pipes and/or pipe sleeves, etc., at underside of existing floor or roof slabs to maintain appropriate fire ratings as required by code, to agree with structural details for closing openings and to create a flush surface to receive finish materials where there are no suspended ceilings.

F. The General Contractor is to provide all furred-out chases where required and also to provide furred-out chases on all other floors as indicated on drawings to conceal new pipes, conduits, etc. Chases shall be constructed of 3 5/8" metal stud with one layer of 5/8" Type X drywall. The furred-out chase is to extend from the floor to the new or existing ceiling or to above existing ceiling or to underside of slab where there are no ceilings. The overall depth and width of the chase is to be held to a minimum to allow maximum space for the room or corridor. The furred-out chase is to be finished to match existing, a base is to be installed to match existing and where there is an existing ceiling, the existing ceiling or a new ceiling to match the existing ceiling is to be reinstalled to abut the new furred-out chase.

G. The respective subcontractors are to remove all "abandoned" heating pipes, ductwork, plumbing lines, electrical conduits and sleeves that are within the existing floor or wall areas of work. If

the piping, conduit or ductwork is passing through a floor slab or wall, remove the item as previously described, cut any sleeve off flush with the present concrete floor slab or wall, fill the opening and put a finish patch on the top and bottom sides of the slab or wall. All piping shall be cut and capped to below the floor or back to riser.

3.6 COMPLETION

A. The General Construction Contractor shall leave Demolition and Alteration areas free of debris caused by Work of this project. The Demolition and Alteration areas shall be left in good order and clean, to the entire satisfaction of the Owner and the Architect.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.

2. Recycling nonhazardous demolition and construction waste.

3. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

Demolition Waste:

a. Concrete masonry units.

b. Plywood and oriented strand board.

c. Wood trim.

d. Structural and miscellaneous steel.

e. Rough hardware.

f. Insulation.

g. Doors and frames.

h. Door hardware.

i. Glazing.

j. Gypsum board.

k. Acoustical tile and panels.

l. Equipment.

m. Piping.

n. Supports and hangers.

o. Valves.

p. Mechanical equipment.

q. Refrigerants.

r. Electrical conduit.

s. Copper wiring.

t. Lighting fixtures.

u. Lamps.

v. Ballasts.

w. Electrical devices.

x. Switchgear and panelboards.

y. Transformers.

2. Construction Waste:

a. Masonry and CMU.

b. Lumber.

c. Wood sheet materials.

d. Wood trim.

e. Metals.

f. Gypsum board.

g. Piping.

h. Electrical conduit.

i. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.

2) Cardboard.

3) Boxes.

4) Plastic sheet and film.

5) Polystyrene packaging.

6) Wood crates.

7) Plastic pails.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. Waste Reduction Work Plan: Review each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

2.0 PART 2 - PRODUCTS (Not Used)

3.0 PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.

2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.

3. Store items in a secure area until installation.

4. Protect items from damage during transport and storage.

5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Permitted on Project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.

5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Clean and stack undamaged, whole masonry units on wood pallets.

C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

D. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.

2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

G. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

I. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

2. Polystyrene Packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.

2. Project record document submittal.

3. Operating and maintenance manual submittal.

4. Instruction of the Owner’s personnel.

5. Submittal of warranties.

6. Final cleaning.

B. Related Sections include the following:

1. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

3. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show the percent of completion as specified in the Supplementary General Conditions for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

2. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

3. Advise Owner of pending insurance changeover requirements.

4. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits (certificate of occupancy), operating certificates, certificates of inspection and similar releases.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.

8. Complete startup testing of systems.

9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect **and Construction Manager** will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the Contract Sum and unused allowances.

3. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.

4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

5. Submit Consent of Surety to Final Payment and Waiver of Claims.

6. Submit a copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.

7. Submit pest-control final inspection report and warranty.

8. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

9. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.

10. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Reinspection Procedure: Submit a written request for final inspection for acceptance. On receipt of request, Architect **and Construction Manager** will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected, except items whose completion has been delayed because of circumstances acceptable to the Architect and Owner.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.

b. Date.

c. Name of Architect[and Construction Manager].

d. Name of Contractor.

e. Page number.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.7 RECORD DOCUMENT SUBMITTALS

A. Maintenance of Record Documents: Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's **and Construction Manager's** reference during normal working hours.

B. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

C. Record Prints: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work. Accurately record information in an understandable drawing technique.

2. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

3. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

4. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.

   b. Revisions to details shown on Drawings.

   c. Depths of foundations below first floor.

   d. Locations and depths of underground utilities.

   e. Revisions to routing of piping and conduits.

   f. Revisions to electrical circuitry.

   g. Actual equipment locations.

   h. Duct size and routing.

   i. Locations of concealed internal utilities.

   j. Details not on the original Contract Drawings.

   k. Field records for variable and concealed conditions.

   l. Record information on the Work that is shown only schematically.

5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

6. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

D. Reproducible Record Drawings: At the time of Substantial Completion the Prime Contractor shall obtain from the Architect at the Contractor's expense, 20-pound white bond paper copies of the original contract drawings, including drawings issued by addendum, and job drawings issued during construction. The Contractor shall revise the drawings to indicate all changes made during construction based upon the marked up print drawings maintained during the course of construction. The drawings shall be modified by someone skilled in drafting and lettering in a manner consistent with the appearance of the original drawings.

1. It is not intended that the Contractor incorporate addenda drawings or job drawings into the original contract drawings.

2. Each drawing shall bear the notation "RECORD DRAWING OF WORK" and the date.

3. The Contractor shall submit the modified bond paper drawings and one set of prints to the Architect for his review and for delivery to the Owner.

4. Organize reproducible record drawings into unbound sets matching Record Prints. Place drawings in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

5. The Contractor shall submit electronic copies of the final record drawings in PDF format. Organize into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification.

    a. Electronic Media: Provide CD-R. Identify as follows:

        1) Project name.

        2) Date.

        3) Designation "PROJECT RECORD DRAWINGS."

        4) Name of Architect and Construction Manager.

        5) Name of Contractor.

E. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders, Record Drawings where applicable.

F. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

G. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the

Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

H. Maintenance Manuals: Submit to the Architect for review one original and three copies of instruction and maintenance manuals. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Operation Data:

a. Emergency instructions and procedures.

b. System, subsystem, and equipment descriptions, including operating standards.

c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

d. Description of controls and sequence of operations.

e. Piping diagrams.

2. Maintenance Data:

a. Manufacturer's information, including list of spare parts.

b. Name, address, and telephone number of Installer or supplier.

c. Maintenance procedures.

d. Maintenance and service schedules for preventive and routine maintenance.

e. Maintenance record forms.

f. Sources of spare parts and maintenance materials.

g. Copies of maintenance service agreements.

h. Copies of warranties and bonds.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Such instructions shall be confirmed by a written statement prepared by the Contractor and signed by the designated representative of the Owner. Submit

four copies of statement to the Architect for distribution. Instructions shall include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

C. All systems furnished and installed by the Contractor are his full responsibility until final acceptance, even though operated by the Owner's personnel, unless otherwise agreed in writing.

3.2 DEMONSTRATION AND TRAINING VIDEOTAPES

A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

3.3 FINAL CLEANING

A. General: The general conditions require general cleaining during construction. Regular site cleaning is included in Division 01 Section “Temporary Facilities”.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

D. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for entire Project or for a portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

4. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

5. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

6. Sweep concrete floors broom clean in unoccupied spaces.

7. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

8. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

9. Remove labels that are not permanent.

10. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

11. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

12. Replace parts subject to unusual operating conditions.

13. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

14. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

15. Clean ducts, blowers, and coils if units were operated without filters during construction.

16. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

17. Leave Project clean and ready for occupancy.

E. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

F. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

G. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

    1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 017700

SECTION 019113 – COMMISSIONING REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning (Cx) is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. The commissioning process shall coordinate components of the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

B. The intent of the commissioning on this project is to fulfill the commissioning requirements of C408 of the 2020 Energy Conservation Construction Code of New York State (ECCCNYS). This overview is provided to outline those requirements and detail the responsibilities of all parties.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing Contractors to provide a finished and fully functioning product.

1.2 RELATED SECTIONS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

B. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 230593 – Testing and Balancing

2. Section 230923 – Temperature Controls

3. Refer to Section 230010 for additional requirements related to Operation and Maintenance Manuals.

1.3 ABBREVIATIONS. The following are common abbreviations used in these Specifications.

A/E-	Architect and Design Engineer	FT-	Functional Performance Test
BACS-	Building Automation Control System	CM-	Construction Manager
CA-	Commissioning Authority	TAB-	Test and Balance
Cx-	Commissioning		
Cx Plan-	Commissioning Plan		

1.4 COORDINATION

A. Commissioning Team.

1. The commissioning team members shall include Commissioning Authority, the Owner's Construction Manager/Project Manager (CM), the Architect and Design Engineers, and the various construction contractors on the project with work associated with the systems to be commissioned ("contractor"). This generally includes, but may not be limited to representatives from the General Contractor (GC), the Mechanical (HVAC) Contractor(s) (MC), the Plumbing Contractor (PC), the Testing and Balancing Contractor (TAB), the Controls Contractor (CC), the Electrical Contractor (EC) and any other installing Subcontractors or suppliers of equipment. The Owner may designate facilities staff as members of the commissioning team.

2. The contents of these specifications describe the roles and responsibilities for each of the traditional commissioning team members. In the event that individuals serve multiple roles, the responsibilities shall equally apply.

B. Management.

1. The CA shall be provided directly by the Owner. The CA directs and coordinates the commissioning activities and reports to the CM and Owner. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling.

1. The CA shall work with the CM according to established protocols to schedule commissioning activities. The CA shall provide sufficient notice to the CM for scheduling commissioning activities. The CM shall regularly update the CA regarding construction progress, changes to commissioned systems, and expected completion. The CM shall inform the CA a minimum of 14 days in advance when initial start-up appointments are scheduled for commissioned systems. The CM shall integrate all commissioning activities into the master schedule and shall maintain an adequate window of time for each required activity. All parties shall address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan. The Commissioning Plan provides guidance in the execution of the commissioning process.

1. The CA shall distribute a draft Commissioning Plan in an industry standard format to the Commissioning Team as early as practical in the construction process.

2. Based on construction observations, changes in project scope or at the discretion of the CA, the commissioning plan may be updated throughout the construction process and during actual testing procedures as necessary to adequately validate the operation of systems being commissioned.

3. The commissioning plan shall contain, as a minimum:

   a. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.

   b. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.

   c. Functions to be tested, including, but not limited to, calibrations and economizer controls.

   d. Conditions under which the test will be performed. Testing shall affirm winter and summer design conditions and full outside air conditions.

   e. Measurable criteria for performance.

B. Commissioning Process. The following provides a brief overview of typical construction phase commissioning tasks and the general order in which they occur.

1. Commissioning during construction begins with the ongoing development of the Commissioning Plan by the CA. This includes formalizing testing procedures and processes.

2. A Pre-Commissioning meeting may be conducted by the CA. The commissioning testing procedures are reviewed at this time and opened for comment by additional team members.

3. Additional meetings may be required during construction to plan, coordinate, schedule future activities, and resolve issues. The additional meetings will be scheduled through the CM with necessary parties attending.

4. Appropriate documentation and communication paths (project dependent) are developed with all team members.

5. The CA will perform two (2) progress compliance inspections to determine deviations from contract documents, construction issues which may adversely affect the ability to commission the systems, and / or make recommendations to improve project outcome. In the event that observations require clarification from other members of the Commissioning Team, these requests for information shall be placed in writing and become part of the commissioning record.

6. Detailed equipment start-up procedures for major equipment shall be submitted to the CA for review and comment. Depending on project complexity, the CA may attend selected equipment startups, and shall be notified a minimum of 14 days prior to their scheduled date.

7. The CA develops specific equipment and system Functional Performance Test procedures and forms. These shall be presented within the Commissioning Plan or separate associated document package.

8. The Functional Performance Tests are executed by the Contractors under the direction of the CA. The CA documents functional performance test results.

9. Items of contract non-compliance in material, installation or setup are documented by the CA and forwarded in appropriate report format for correction at the Contractor's expense. Non-compliance issue resolutions shall be documented in a Commissioning Issues Log (or other acceptable format) by the CA. This log shall be maintained throughout the project, and include items noted during site inspections and functional performance testing.

10. Prepare a preliminary report of commissioning test procedures and results. Report is to be certified as a complete summary of findings and shall be forwarded to the Engineer for review and comment prior to being provided to the building Owner or Owner's Representative. Failure to provide this report in a timely manner may delay building occupancy. The report shall contain the following:

    a. Clearly labeled as "Preliminary Commissioning Report".

    b. Organized with mechanical and service hot water findings in separate sections to allow independent review.

    c. Itemization of deficiencies found during testing that have not been corrected at the time of report preparation.

    d. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.

    e. Climatic conditions required for the performance of deferred tests.

11. Seasonal or other deferred testing may be required to optimally test the systems and shall be conducted as required for system performance verification. These tests, and participation by all commissioning team members, shall be provided at no additional costs to the Owner.

12. The CA prepares a final report to document the results of the commissioning process. The final report shall be provided to the Owner or Owner's Representative within 90 days of receipt of the certificate of occupancy.

1.6 RESPONSIBILITIES

A. The general roles and responsibilities of the primary Cx team members toward the Cx process are outlined in this section. Other various additional startup activities related to the Cx process reside in the specific sections for equipment (boilers, chillers, etc), systems (Temperature controls), or activities (testing and balancing).

B. Architect (of A/E)

1. Construction and Acceptance Phase:

a. Attend any pre-commissioning scoping meeting and selected commissioning team meetings.

b. Perform usual and customary submittal review and construction observation.

c. Provide design narrative documentation requested by the CA necessary to clarify design intent.

d. Coordinate resolution of system deficiencies identified during commissioning, according to the Contract Documents.

e. Review and approve the O&M Manuals

C. Mechanical, Plumbing and Electrical Designers/Engineers (of the A/E)

1. Construction and Acceptance Phase:

a. Attend commissioning scoping meetings and other selected commissioning team meetings.

b. Perform usual and customary submittal review and construction observation.

c. Provide design narrative and sequence documentation requested by the CA. The designers shall assist (along with the Contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

d. Participate in the resolution of system deficiencies identified during commissioning, according to the Contract Documents.

e. Review the Preliminary Commissioning Report, append any necessary comments, and transmit document to the Owner for record. Failure to review and transmit this manual to the Owner in a timely manner may delay final inspections and occupancy.

f. Review and approve the MEP/FP component of the O&M Manuals.

g. Approve air and water systems balancing reports.

h. Provide technical review and assistance to the Owner and Architect regarding CA comments reflecting upon the Commissioning Activities.

D. Commissioning Authority (CA)

1. Construction and Acceptance Phase:

a. Coordinate and direct the commissioning activities in a logical, sequential, and efficient manner using technical expertise, consistent protocols and forms, centralized documentation, clear and regular communications/consultation with all necessary parties, and frequently updated timelines/schedules.

b. Coordinate the commissioning work and, with the CM, ensure that commissioning activities are being scheduled into the master schedule.

c. Develop the Commissioning Plan document that describes construction phase commissioning activities.

d. Plan and conduct a pre-commissioning meeting and other commissioning meetings as needed.

e. Before startup, review the current control sequences and interlocks and work with Contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.

f. Perform (2) site visits to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

g. Write the Functional Performance Test procedures and develop test forms for equipment and systems.

h. Analyze any functional performance trend logs and monitored data to verify performance.

i. Supervise manual Functional Performance Tests with installing Contractors. Coordinate retesting as necessary until satisfactory performance is achieved.

j. Maintain a master Commissioning Issues Log and testing records. Communicate test results and non-compliance issues to the CM. Recommend actions to resolve non-compliance issues.

k. Compile and maintain the Commissioning Record Manual.

l. Review, spot validate, and certify the accuracy and completeness of the lighting controls testing performed by the Electrical Contractor (see section 265100 and paragraphs C408.3 through C408.3.2 of the 2020 Energy Conservation Construction Code of New York State for testing and documentation requirements).

m. Provide a final Commissioning Report providing the following information:

1) Organized with mechanical and service hot water findings in separate sections to allow independent review.

2) Disposition of deficiencies found during testing, including details of corrective measures used or proposed.

3) Outcome of deferred tests that could not be performed at the time of preliminary report preparation because of climatic conditions, and the conditions under which the tests were performed.

4) Functional performance test procedures used during the commissioning process, including measurable criteria for test acceptance (provided in report for repeatability).

2. Warranty Period:

a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

E. Construction Manager - Owner's Project Manager (CM)

1. Construction and Acceptance Phase:

a. Facilitate the coordination of the commissioning work by the CA. Maintain commissioning activity in the master schedule. For successful commissioning it is critical that the master schedule clearly denote adequate time frames for each of the following work segments:

1) Completion and startup of all mechanical equipment

2) Completion and pre-commissioning of temperature control systems (reference 230923.3.8)

3) Completion of Testing and Balancing of HVAC Systems

4) Functional Testing of HVAC and remediation of Issues Log findings. **Functional testing shall not commence until the CA has received complete confirmation of and / or startup reports for all HVAC equipment from the Mechanical contractor and completed pre-commissioning forms from the Temperature Controls Contractor. The CA may, at their discretion, proceed with functional testing prior to receipt of a fully certified testing and balancing report, approved by the Engineer of Record.**

b. Review the final Construction Phase Commissioning Plan.

c. Coordinate and attend a pre-commissioning meeting and other commissioning team meetings.

d. When requested by the CA, observe startup and functional testing of selected equipment.

e. Coordinate the resolution of non-compliance and design deficiencies.

f. Review Commissioning Issues Log and follow up Contractors to achieve resolution of non-compliance issues.

g. Furnish a copy of all Contract Documents, as-built documents, addenda, change orders, approved submittals, and shop drawings related to commissioned equipment to the CA.

2. Warranty Period:

a. Assist the CA as necessary in the seasonal or deferred testing and

b. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

F. Contractors

1. Construction and Acceptance Phase:

a. The Contractors shall provide all tools or the use of tools to start, check-out, and functionally test equipment and systems.

b. Execute commissioning responsibilities according to the Contract Documents and schedule.

c. A representative shall attend a pre-commissioning meeting and other necessary meetings scheduled by the CM and CA to facilitate the Cx process.

d. Provide to the CA detailed start-up procedures, all requested submittal data, and specific Owner responsibilities required to keep warranties in force.

e. Execute Functional Performance Tests under the direction of the CA. The CA documents the Functional Performance Test process and results.

f. Correct non-compliance issues.

g. Prepare O&M Manuals according to the Contract Documents; clarify and update the original control sequences to as-built conditions.

2. Warranty Period:

a. Execute seasonal or deferred Functional Performance Testing, witnessed by the CA, according to the specifications.

b. Correct non-compliance issues and document resolutions in the Commissioning Issues Log and make necessary adjustments to O&M Manuals and as-built drawings for applicable issues identified in any seasonal testing.

G. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.

2. Assist in equipment testing per agreements with Contractors.

3. Include all special tools and instruments (e.g., tools only available from vendor or specific to a piece of equipment) required for testing equipment according to these Contract Documents.

4. Provide information requested by CA regarding equipment control sequences and testing procedures.

5. Review test procedures for equipment installed by factory representatives.

H. Owner (or Owner's Authorized Representative)

1. Construction and Acceptance Phase:

a. A representative shall attend a pre-commissioning meeting and other necessary meetings scheduled by the CM and CA to facilitate the Cx process.

b. Assist to the extent necessary with access and scheduling for testing of mechanical and service hot water systems.

c. Provide transmittal to the Code Official that acknowledges receipt of the Preliminary Commissioning Report. Failure to provide transmittal may delay final inspection and occupancy of the project. On request by the Code Official, release a copy of the Preliminary Commissioning Report for Code Official review, or authorize the CA to do so on behalf of the Owner.

1.7 SYSTEMS TO BE COMMISSIONED

Option 1 Example:

A. All energy consuming equipment as schedule on drawings H6.00, H6.01 and H6.02.

B. All newly installed or modified / existing HVAC Control Systems as described on drawings H5.00, H5.01, and H5.02 and within Specification Sections 230923.

2.0 PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required Functional Performance Testing shall be provided by the Division Contractor for the equipment being tested. For example, the mechanical (HVAC) Contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure and humidity sensors shall have an accuracy of + or - 2.0% of the value being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

3.0 PART 3 - EXECUTION

3.1 MEETINGS

A. Commissioning Scoping Meeting. The CA (through the CM) shall schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA (through the CM) as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Contractors. The CA will plan these meetings and will minimize unnecessary time being spent by the Contractors.

3.2 REPORTING

A. The CA will coordinate commissioning meetings and activities through the CM. The CA will develop and maintain the Commissioning Issues Log to document non-compliance issues and deficiencies noted throughout the Cx process. The CA will regularly submit the Commissioning Issues Log to the CM who is responsible for communicating deficiencies to the responsible Contractors and coordinating resolution to issues. The CM and all Contractors are responsible for detailing the resolution of issues in the Commissioning Issues Log and returning it regularly to the CA as issues become resolved.

B. A preliminary commissioning report shall be generated meeting the requirements of paragraph 1.5.B.10.

C. A final commissioning report shall be generated meeting the requirements of paragraph 1.6.D.1.m.

3.3 START-UP AND INITIAL CHECKOUT

A. The Contractor responsible for the purchase of the equipment shall attach completed manufacturer's detailed start-up and checkout procedures and the Contractor's normally used field checkout sheets.

B. Sensor and Actuator Calibration. In lieu of specifications to the contrary, all field-installed control components and sensors (e.g., temperature, relative humidity, CO_2, pressure) and all actuators (e.g., dampers and valves) on all equipment shall be pre-commissioned as described within section 230923.1.10. The following general format shall be used by the contractor for recording all calibration results. Alternate methods and recording formats may be used if approved by the A/E and CA. All test instruments shall have had a certified calibration within the preceding 12 months.

Project Name:
IBC Project #
SED Project #

Temperature Controls Pre-Commissioning Checklist

Analog Inputs

Equipment	Point Name	Sensor Range	Reference Reading	Sensor Reading	Testing Method

Analog Outputs

Equipment	Point Name	Output Range	Visual Verification	Upstream Temp	Downstream Temp

Binary Inputs

Equipment	Point Name	Verified Closed Status	Verified Open Status	Associated Binary Output	

Binary Outputs

Equipment	Point Name	Enable / Disable Verified	Associated Binary Input	Hard Wire Interlocks tested

C. Pre-Commissioning shall include completion of the following additional items. The Controls Contractor, via the Construction Manager, shall provide a notice to the Commissioning Authority certifying that the following have been completed and are ready for testing.

1. Communication Network Startup – All controllers and integration with factory controllers shall be completed.

2. Graphical User interface – the GUI shall be completed and ready for review for compliance with section 230923.

3. Software – The contractor shall certify that the software meets the requirements of the contract documents and is ready for functional testing.

D. Functional testing shall not proceed until pre-commissioning as described under this paragraph, including the notice of certification to the Commissioning Authority are complete, reviewed and accepted by both the CA and the A/E.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. The commissioning activities described in the Functional Performance Tests as contained in the commissioning plan shall be performed by the contractor under the direction of the CA. Each task shall be assigned to the appropriate trade, generally the specific contractor providing the equipment. Only skilled tradesmen knowledgeable in the operation of the equipment and systems shall be perform the each of the FT requirements.

B. Objectives and Scope. The objective of Functional Performance Testing is to demonstrate that each system is operating according to the documented Design Intent and Contract Documents. Functional Performance Testing facilitates bringing systems from a state of substantial completion to full dynamic operation. During the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

C. In general, each system will be operated through all critical modes of operation (e.g., seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verify each action and response documented in control sequences. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. may also be tested.

D. Test Methods.

1. Functional Performance Testing and verification may be achieved through a combination of manual testing (manual manipulation of the equipment and observation performance), monitoring field performance data and analyzing the results using the control system’s trend log capabilities or by stand-alone dataloggers.

2. Setup. Each function and test shall be performed under conditions that simulate actual conditions as closely as is practicable. The tradesmen executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. Upon completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition. In the event that commissioning leads to changes in the baseline control setpoints and / or parameters, these shall be closely documented by the CA and forwarded to the Owner and A/E team for technical evaluation.

3. Coordination and Scheduling. The Contractors via the CM shall provide sufficient notice to the CA regarding their completion schedule for the Pre-Commissioning activities and startup of all equipment and systems.

   a. In general, functional testing is conducted after control system Pre-Commissioning and startup and Testing and Balancing have been satisfactorily completed. The control system is to be sufficiently tested before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing to be is completed and debugged before functional testing of air-related or water-related equipment or systems

4. Problem Solving. The CA may recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, GC, Contractors and A/E.

3.5 DOCUMENTATION, NON-COMPLIANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all Functional Performance Tests using the specific procedural forms developed for that purpose.

B. Non-Compliance.

1. The CA shall record the results of the Functional Test on the test form. All deficiencies or non-compliance issues shall be noted and reported to the CM via a Commissioning Issues Log, developed by the CA.

2. Minor deficiencies identified during testing may be corrected during testing at the discretion of the CA. In such cases the deficiency and resolution will be documented on the Commissioning Issues Log.

3. Every effort will be made to expedite the testing process without compromising the integrity of the test procedures. However, the CA shall not be pressured into overlooking deficiencies or loosening acceptance criteria to satisfy scheduling or cost issues unless the Owner provides a written request to do so.

4. Each deficiency identified during testing shall be recorded on the Commissioning Issues Log. The CM shall coordinate resolution of any deficiencies. Any disputes regarding the validity of or responsibility for correcting a deficiency shall follow these guidelines:

   a. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.

   b. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

   a. The cost for the CA to retest / re-verify a Functional Test, after a second round of testing on a piece of equipment shall be provided by the party responsible for the defect or deficiency. In the event that multiple parties are responsible for test failures, any cost recovery for retesting shall be negotiated with the CM and subsequently assigned to the responsible parties.

6. Any required retesting by any Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

7. Failure Due to Manufacturer Defect. If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, all identical units may be considered unacceptable by the CA. In such case, the Contractor shall provide the Owner with the following:

   a. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.

   b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

   c. The CM shall determine whether a replacement of all identical units or a repair is acceptable.

   d. Two examples of the proposed solution shall be installed by the Contractor and the A/E and CA shall be allowed to test the installations for up to one week, where after the A/E, taking into account information provided by the CA shall decide whether to accept the solution.

   e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

3.6 DEFERRED TESTING

A. Seasonal / Deferred Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design conditions) shall be completed as part of this contract. The CA shall note in the final commissioning report where environmental conditions did not allow for definitive results, or where testing could not be completed, and a description of requirements to complete the functional testing with a plan for implementation. The Owner and CM shall coordinate this activity with the Contractors. The results of this testing shall be forwarded to the CA to update the Commissioning Report. Any final adjustments to the O&M Manuals and as-built drawings due to the testing shall be made by the contractors.

END OF SECTION 019113

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

2. Demolition and removal of selected site elements.

3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.

2. Section 017300 "Execution" for cutting and patching procedures.

3. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and **store for reuse**.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at **Project site**.

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property**, for environmental protection, for dust control and, for noise control**. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's **building manager's and other tenants'** on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Use of elevator and stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:

a. Furniture.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Roofing System.

a. Obtain existing warranties from Owner.

B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of **preconstruction photographs or video**.

1. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for at least **4** hours after flame-cutting operations.

6. Maintain adequate ventilation when using cutting torches.

7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly. **Comply with requirements in Section 017419 "Construction Waste Management and Disposal."**

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area **designated by Owner**.

5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition **and cleaned** and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." **Do not use methods requiring solvent-based adhesive strippers.**

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075323 EPDM Roofing for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.

2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site **and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."**

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 028200 – REMOVAL AND DISPOSAL OF ASBESTOS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, licenses, facilities, equipment, services, employee training and testing, permits and agreements necessary to perform the work required for asbestos removal, encapsulation and enclosure in accordance with these specifications, the latest regulations from the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the State of New York, the recommendations of the National Institute of Occupational Safety and Health (NIOSH), Standard 241 of the National Fire Protection Association (NFPA) and any other applicable federal, state, and local government regulations.

B. The work specified herein shall be performed by competent persons trained, knowledgeable and qualified in state-of-the art techniques of asbestos abatement, handling, and the subsequent cleaning of contaminated areas.

C. Whenever there is a conflict or overlap of the above references or within this specification, the most stringent provision shall apply.

1.2 SCOPE OF WORK

A. The work covered by this section includes the removal and disposal of asbestos containing and asbestos contaminated material(s) impacted by the project.

B. Extent of material removal and information pertinent to each material is illustrated on the contract drawings. Abatement Contractor must satisfy themselves as to quantities and conditions, and base their bid accordingly. For the purpose of bidding, the contractor shall provide a bid that includes all labor, expenses, fees, insurance, bonding, disposal, overhead and profit to complete the removal and disposal of materials specified herein. Specific details pertaining to the abatement scope of work are indicated on the contract drawings. Exact locations and quantities of concealed materials have been estimated based on available plans. Discrepancies in location, or quantities in excess of 10 percent, must be noted in writing and given to the building owner before materials are removed so quantities can be independently verified.

C. All asbestos containing materials within the contract limits must be removed and disposed of unless specifically excluded in these specifications or on the drawings. Types and quantities of asbestos containing materials are indicated in the material schedules. The contractor shall be responsible for removal and disposal of any and all asbestos containing materials excluded in these contract documents that are consequentially damaged as a result of the contractor's activities. Contractor shall bear all consequential costs incurred to the owner as a result of these activities (i.e. air sampling, etc.) Those materials shall be removed and disposed of as asbestos at no additional cost to the owner.

D. Phasing and sequence of completion shall be coordinated with other work as indicated in project schedules. In each instance, the contractor shall be responsible for the completion

of the necessary removals, work area boundary and type (i.e. full containment, glovebag, large project, small project, etc.) as indicated on the drawings and compliance with appropriate federal, state, and local regulations.

General Requirements

The following general requirements apply for the project except where noted otherwise. These shall include, but not be limited to the following:

- Worker training, respiratory protection, and medical examinations.
- Construct worker decontamination enclosure and establish negative air pressure differentials in work area(s) prior to work area preparation.
- Preparation of work areas including: pre-cleaning, erection of temporary isolation barriers, containment and establishing negative pressure within the work area.
- Construction of worker and equipment decontamination enclosure systems.
- Provision of hot and cold running water in personnel decontamination enclosure system.
- Isolation of ductwork within the work area.
- Provision of temporary lighting and power to work areas including installation of ground fault interrupters. Temporary power shall be suitable to serve the requirements of the contractor and the air sampling requirements of the environmental consultant.
- Provision of building security in coordination with owner/construction manager.
- Provision of site security to assure that no member of the public is able to gain access to the asbestos work area at any time.
- Provision of emergency evacuation plan.
- Provision for shower wastewater disposal.
- EPA/NYSDOL accredited asbestos abatement supervisor on site during all abatement activities.
- Selective demolition to access ACM materials for removal.
- Removal and disposal of asbestos containing and asbestos contaminated materials (ACM) as indicated on the drawings.
- Glovebag removal performed in accordance with OSHA regulation 1926.1101, and NYS ICR-56 where applicable.
- Sealing and labeling of chase(s) from which ACM is not removed.
- Packing, labeling, transportation and disposal of contaminated material.
- Decontamination of work area(s) for final clearance air sampling.
- Replace, repair and paint any surface disturbed by this work to original conditions including replacement or repair of any mechanical or electrical systems disturbed during contractor activities.
- Conformance with the owner's policies and procedures regarding work on their property.

1.3 ABATEMENT SCHEDULES AND RELATED WORK

A. During the progress of the work, other contractors may be engaged in performing work. The contractor shall coordinate their work with the work of other contractors in such a

manner as the owner or construction manager may direct. Contractor shall provide sufficient staff to complete all work in the allowed time period.

B. If the owner/construction manager determines that the contractor is failing to coordinate with the work of other contractors as directed:

1. The owner shall have the right to withhold any payments due under the contract until the owner/construction manager's directions are complied with by the contractor; and
2. The contractor shall defend, indemnify, and hold the owner/construction manager/environmental consultant harmless from any and all claims, judgments, or damages, and from any costs or damages to which the owner or owner's representatives may be subjected or which they may suffer or incur by reason of the contractor's failure to promptly comply with directions.

C. The owner/construction manager cannot guarantee the responsibility, efficiency, operations or performance of any contractor. The contractor acknowledges these conditions and shall bear the risk of all delays including, but not limited to, delays caused by the presence or operations of other contractors and delays attendant upon any construction schedule approved by the owner or owner's representatives and the owner or his representatives shall not incur any liability by reason of any delay.

D. The contractor shall complete all asbestos work within the accepted schedule. The contractor shall provide staffing as necessary to complete the scope of work awarded by the owner. This shall include working multiple shifts Monday through Friday, Saturday, and Sunday if necessary and approved by the owner/construction manager. Contractor's bid shall be inclusive of these costs. This project shall be completed in several phases as determined by the project schedule.

1.4 PRE-BID MEETING

A. Bidders shall attend a pre-bid meeting. Refer to the Notice to Bidders for the designated time and place. Attendance at this meeting by the bidders or bidder's qualified representative will be recorded.

B. At the time of bid opening, each bidder shall acknowledge that they have investigated and are satisfied as to: 1) the conditions affecting the scope of work, including but not limited to, physical conditions of the site which may bear upon site access, handling and storage of tools and materials, access to water, electric or other utilities which affect performance of the required activities, 2) the character and quantity of all materials and obstacles to be encountered in so far as this information is reasonably ascertainable from an inspection of the site, including exploratory work done by the owner or owner's representative, as well as information presented in drawings and specifications included with this contract. The owner is not responsible for any conclusions or interpretations made by the contractor on the basis of the information made available by the owner or owner's representative.

1.5 BIDDER EVALUATION

A. The owner and owner's representatives may make such investigation as deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the owner all such information and data for this purpose as the owner may request. The owner reserves the right to reject any bid if the evidence submitted by or investigation of such bidder fails to satisfy the owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids shall not be accepted.

1.6 DEFINITIONS

A. The following definitions apply throughout the Contract Documents:

1. Aggressive Sampling - an air sampling technique whereby air samples are collected while fans or air circulating devices are operated in a work area.
2. AIHA - The American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, Ohio 44311.
3. Airlock - a system consisting of two curtained doorways for permitting ingress or egress without permitting air movement between any two adjacent areas.
4. Air Monitoring - The process of measuring the fiber content of a specific volume of air in a stated period of time.
5. Amended Water - water to which a surfactant has been added at a ratio according to the manufacturer's directions.
6. Area Air Sampling - any form of air sampling or monitoring where the sampling device is placed at a stationary location.
7. Asbestos Board - A sheet of fire-resistant material made from asbestos fiber and portland cement.
8. Asbestos Containing Material - (ACM) Any material containing more than 1% asbestos by weight.
9. Asbestos Handler – an EPA/NYSDOL certified person who removes, encapsulates, or encloses asbestos containing material or who disturbs friable asbestos.
10. Asbestos Handling Certificate - a certificate issued by the New York State Commissioner of Labor to a person who has satisfactorily completed an approved asbestos safety program.
11. Asbestos Handling License - a license issued by the New York State Commissioner of Labor pursuant to the provisions of Part 56, Title 12, NYCRR to a contractor engaged in the installation, removal, application, enclosure or encapsulation of asbestos or asbestos containing material or the disturbance of friable asbestos.
12. Asbestos Project - work undertaken by a licensed contractor which involves the removal, encapsulation, or enclosure of asbestos containing material, or the disturbance of friable asbestos.
13. Asbestos Removal/Abatement Operations - all herein specified procedures pertaining to the removal and disposal of asbestos containing materials.
14. Asbestos Work Area - a work space as indicated in the contract drawings within which all ACM is being removed

15. Authorized Visitor - a representative of the building owner, or a representative of any regulatory or other agency having jurisdiction over the project.
16. Background Level Monitoring - a method used to determine airborne asbestos fiber concentrations inside and outside of an abatement work area prior to starting an asbestos project.
17. Building Owner - the person or agency in whom legal title to the premises is vested unless the premises are held in a land trust, in which instance building owner means the person to whom beneficial title is vested.
18. Clean Equipment Room - a room between the holding room and non-work area which is part of the equipment/waste decontamination enclosure system.
19. Clean Room - an uncontaminated room which is part of the personnel decontamination enclosure system, with provisions for storage of workers' street clothes and protective equipment.
20. Critical Barrier - a unit of temporary construction which provides separation of an asbestos work area and an adjacent, potentially occupied space.
21. Curtained Doorway - a device which is constructed of three overlapping sheets of 6 mil polyethylene sheeting over an existing or temporarily framed doorway.
22. Differential Air Pressure System - a portable, powered HEPA-filtered system used to exhaust air from the work area to outside the building.
23. Encapsulant - a liquid material which can be applied to asbestos containing material and which controls the release of asbestos fibers from the material by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).
24. Encapsulation - all herein specified procedures necessary to coat asbestos containing material or asbestos contaminated surfaces with an encapsulant to control the possible release of asbestos fibers into the ambient air.
25. Enclosure - The construction of airtight walls, ceiling and floors between the asbestos containing material and the facility environment.
26. Environmental Consultant - technical representative of Building Owner.
27. Equipment/Waste Decontamination Enclosure System - a decontamination system for materials and equipment consisting of a designated location of the work area for a washroom, and holding room separated from the work area and from each other by two airlocks.
28. Equipment Room - a room which is part of the personnel decontamination enclosure system, with provisions for storage of contaminated clothing or equipment.
29. Final Clearance Level - the airborne asbestos level will be considered acceptable upon meeting the criteria specified by NYS ICR-56 and EPA AHERA regulations.
30. Fixed Object - a unit of equipment or furniture in the work area which cannot be removed from the work area.
31. Friable - that condition of asbestos containing materials that are capable of being crumbled, pulverized, crushed, or reduced to powder by hand pressure and released into the air.
32. Glove Bag Technique - a method for removing asbestos containing material.
33. Grade D Air - Breathing air which has between 19.5% - 23% oxygen, no more than 5 mg/m^3 of condensed hydrocarbons, no more than 20 ppm of carbon monoxide, no pronounced odor, and a maximum of 1000 ppm carbon dioxide.

34. Ground Fault Circuit Interrupter - A circuit breaker that is sensitive to very low levels of current leakage from a fault in an electrical system.
35. HEPA Filter - a high efficiency particulate air (HEPA) filter which has a tested and documented efficiency for trapping and retaining a minimum of 99.97% of a 0.3 micrometer (aerodynamic diameter) dioctylpthalate (DOP) test aerosol.
36. HEPA Vacuum Equipment - vacuuming equipment with a HEPA filtration system.
37. Holding Room - a room between the washroom and a non-contaminated work area.
38. Large Asbestos Project - an asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of 160 square feet or more, or 260 linear feet or more of asbestos containing material.
39. Minor Asbestos Project - an asbestos project involving the installation, removal, disturbance, repair, encapsulation or enclosure of less than ten square feet, or twenty-five linear feet asbestos containing material.
40. Movable Object - a unit of equipment or furniture in the work area which can be removed from the work area.
41. Negative Pressure - An atmosphere created in a work area enclosure such that airborne fibers will tend to be drawn through the filtration system rather than leak out into the surrounding areas. The air pressure inside the work area is less than that outside the work area.
42. Personal Air Monitoring - A method used to determine an individual's exposure to airborne fibers.
43. Personnel Decontamination Enclosure System - a decontamination system for workers consisting of a clean room, a shower room, an equipment room, separated from each other and from the work area by three air locks.
44. Plasticize - to cover floors, walls, ceilings and other surfaces with two layers of 6 mil fire retardant polyethylene sheeting as herein specified.
45. Pre-cleaning - the process of cleaning all non-contaminated objects, ceilings, wall and floors of a proposed work area using wet cleaning methods, HEPA vacuuming equipment, etc., before abatement work commences.
46. PCM-Clearance Level - The PCM-clearance level criteria of less than 0.01 total fibers longer than or equal to 5 micrometers per cubic centimeter of air (f/cc) is required as determined by Phase Contrast Microscopy (PCM) in accordance with NIOSH Method 7400.
47. Shower Room - a room between the clean room and the equipment room in the worker decontamination enclosure system.
48. Small Asbestos Project - an asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of more than ten and less than 160 square feet, or more than twenty-five and less than 260 linear feet of asbestos containing material.
49. T.S.I. - Thermal System Insulation
50. Visible Emissions - any emissions of particulate material or potentially contaminated liquid that can be seen without the aid of instruments.
51. Washroom - a room between the work area and holding area in the equipment/waste decontamination enclosure system.
52. Wet Cleaning - the process of eliminating asbestos and particulate contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with amended water.

53. Work Area - designated rooms, spaces, or areas of the project in which asbestos abatement actions are to be undertaken.

1.7 ASBESTOS HAZARD

A. Asbestos containing material when damaged or disturbed is friable. Wet methods are a primary means of controlling fiber release.

B. Strict compliance with each of the provisions outlined in these specifications for the removal and handling of asbestos containing material is of importance, because:

1. The inhalation of airborne asbestos fibers can cause very serious and often fatal disease.
2. Workers may not be aware they are inhaling asbestos fibers.
3. Symptoms of the disease do not appear for many years.
4. Only the contractor and contractor's employees can prevent, the inhalation of asbestos fibers and the development of asbestos related disease.

1.8 REGULATIONS

A. The contractor shall comply with applicable federal, state, municipal, and local regulations including but not limited to:

1. Title 29, Code of Federal Regulations, Part 1926.58, OSHA, U.S. Department of Labor.
2. Title 40, Code of Federal Regulations, Part 61, Sub-parts A and M, National Emission Standards for Hazardous Air Pollutants, (EPA).
3. Code Rule 56, Title 12, New York State Department of Labor
4. Title 40, Code of Federal Regulations, Part 763, Asbestos Containing Material in Schools (AHERA), (EPA).
5. New York State Department of Environmental Conservation Waste transporter regulations.
6. NYSDOH Title 10 Part 73 – Regulations for Asbestos Training Providers.
7. OSHA 29CFR1910.1001 – General Industry Standard for Asbestos.
8. OSHA 29CFR1910.134 – Respiratory Protection Program.
9. OSHA 29 CFR1910.1200 – Hazard Communication.

B. Post all applicable regulations in a conspicuous place at the job site. Assure that the regulations are not altered, defaced or covered by other materials.

1.9 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.

A. Environmental Protection Agency (EPA):

Regulations for Asbestos (Code of Federal Regulations Title 40, Part 61).

Guidance for Controlling Friable Asbestos Containing Materials in Buildings, EPA 560/5-85-024.
Asbestos Waste Management Guidance, EPA/530-SW-85-007.

B. Occupational Safety and Health Administration (OSHA):

Asbestos Regulations (Code of Federal Regulations Title 29, Part 1926, Subpart D, Section 1926.58 including Appendices.

C. National Institute for Occupational Safety and Health (NIOSH):

A Guide to Respiratory Protection for the Asbestos Abatement Industry under NIOSH IA 85-06 and EPA DW 75932235-01-1.
Respiratory Protection ..... "A Guide for the Employee"

Respirator Decision Logic, DHHS (NIOSH) Publication No. 87-108"

D. American National Standards Institute (ANSI):

Z86.1-1973 Commodity Specification for Air.

E. New York State Department of Labor, New York Code Rules and Regulations, Part 56, Title 12.

F. U.S. Environmental Protection Agency - Asbestos Containing Materials in Schools: Final Rule and Notice Title 40 CFR Part 763.

G. Article 9-A - New York State Education Law - School Asbestos Safety Act

1.10 PATENT NOTICE

A. Techniques, procedures and equipment required by these specifications may be covered by one or more U.S. and/or foreign patents. It is the sole responsibility of the contractor to determine what, if any, patents are applicable, and to meet the requirements of the patent owner regarding the use of these patents.

1.11 PERSONNEL PROTECTION

A. Prior to commencement of work, the workers shall be instructed by the contractor in the areas described in Section 1.12 "Submittals and Notices."

B. Worker Protection - The contractor shall comply with OSHA 29 CFR 1926.1101(h) (Respiratory Protection) and the US EPA Guidance Document, a Guide to Respiratory Protection for the Asbestos Industry under NIOSH IA 85-06 and EPA DW 75932235-01-1.

C. The 8-hour time weighted average (TWA) airborne concentration of total fibers to which any occupant, employee, building maintenance and operations employee, contract tradesman or other building occupant may be exposed shall not exceed 0.1 fibers, longer

than or equal to 5 micrometers, per cubic centimeter of air (f/cc) or background levels, whichever is greater as determined by phase contrast microscopy in accordance with the OSHA Reference Method.

D. Because there is no known safe level of exposure to asbestos, it is prudent to reduce worker's exposures to as low a level as possible. Proper respiratory protection is critical in minimizing exposure. No worker shall be exposed to levels equal to, or greater than, 0.01 f/cc as determined by the assigned protection factor of the respirator worn and the work area fiber levels. Results of personal monitoring shall be posted at a designated location within 72 hours from collection.

E. Visitor Clothing - The contractor shall provide authorized visitors with suitable respirator, cartridges, protective clothing, gloves, headgear, eye protection, and footwear as described herein.

F. Decontamination and work procedures to be followed by workers shall be posted in the equipment room and the clean room.

G. Work area entry and exit procedures as identified in applicable federal, state, or local regulations shall be followed.

1.12 SUBMITTALS AND NOTIFICATIONS

A. Approval by the owner is required of the experience of the asbestos abatement contractor and will be based upon submission at the time of bidding by contractor evidence of the following:

1. Contractor's NYSDOL Asbestos License.
2. Skills and experience with all phases of abatement work as evidenced through participation in at least five (5) asbestos abatement projects of comparable complexity with this project. Include names and phone numbers of references, including project monitoring firm representative.
3. The contractor shall submit a notarized statement, signed by an officer of the company, identifying any citations, penalties, orders to comply, notices of deficiency, or notices of violations issued by Federal, State, or Local regulatory agencies relating to asbestos abatement activity. Include projects, dates and resolutions.

B. Prior to commencement of work, the contractor shall submit the following documents to the environmental consultant. The documents shall be provided to the environmental consultant and/or the building owner at least 10 days prior to the pre-construction meeting. No work will be allowed to start until these documents have been reviewed. The owner reserves the right to disqualify the contractor based on contractor’s submittals.

1. Abatement work plan, including the following:

a. Phase area sequencing and timetable
b. Size, length and number of work shifts per day/per week.
c. Mobilization Schedule

d. Use of applicable variances or approved specific variances obtained by the contractor.
e. Location of anticipated staging areas. Final locations will be coordinated with the building owner/construction manager.

2. Satisfactory proof that written notification has been provided to the EPA regional office with jurisdiction over the project area in accordance with Title 40 CFR Part 61 sub-parts A & M, National Emission Standards for Hazardous Air Pollutants, U.S. EPA; and the New York State Department of Labor in accordance with Part 56, Title 12 of the New York Code of Rules and Regulations.
3. Proof that all required permits including New York State Department of Environmental Conservation waste transporter permits, disposal site locations, and arrangements for transportation and disposal of asbestos contaminated materials, supplies and the like have been obtained.
4. A written description and plan of an emergency alarm system to alert workers in the work area to fire or other emergency situation.
5. Documentation certifying that all employees have received appropriate medical examinations and have successfully passed a fit test for the respirator to be worn. As a minimum, medical exams must be consistent with requirements in OSHA regulation 1926.1101.
6. Provide copies of valid Asbestos Handling Certificates for all personnel demonstrating compliance with Code Rule Part 56, Title 12 of the New York State Department of Labor. Provide copies of NYSDOH Form DOH-2832 as evidence of compliance with EPA MAP. Individuals whose Initial or Refresher training has expired shall not be permitted to work on the project.
7. Written approval and/or permits, as necessary, from the local sanitary district office for the discharging of wastewater into the sanitary sewer system. Documentation must be submitted if permits are not required. Contractor shall be responsible for compliance.
8. A written Hazard Communication Program that complies with the OSHA regulation 29 CFR 1910.1200. Material Safety Data Sheets (OSHA form 174 or equivalent) for all chemicals used during work performed under this section.
9. A written description of plans for providing temporary power.
10. A copy of the form(s) used by the contractor for maintenance of waste shipment records in compliance with EPA NESHAPS regulations.
11. Manufacturers' certification that vacuums, ventilation equipment, and other equipment required to contain airborne fibers conform to HEPA filtration requirements.
12. Manufacturers certification for all materials used in the abatement project meet the requirements of these specifications (as applicable).

C. The contractor and the owner/construction manager shall agree in writing on the condition of the building and fixtures by means of a site tour prior to commencement of the work.

D. The contractor shall provide written notification to construction manager of contractor’s intent to start work at least 10 days in advance. In no case will the contractor start work until authorization to proceed is received.

1.13 AIR MONITORING

A. Air Monitoring will be completed by the project monitor/environmental consultant.

B. The project monitoring firm will collect air samples in accordance with the New York State Department of Labor Industrial Code Rule 56 and EPA AHERA requirements.

C. When visual inspections and/or air monitoring is required, the contractor shall notify the owner and the project monitoring firm, in writing, 48 hours excluding weekends and holidays, in advance of the day and time when the contractor will be ready for such inspections or monitoring.

D. Air monitoring results generated by the project monitoring firm shall not be used by the contractor to represent compliance with regulatory agency requirements for monitoring of worker's exposure to airborne asbestos.

1.14 ENVIRONMENTAL CONSULTANT

A. An environmental consultant will be employed to advise the building owner in matters pertaining to the work performed in accordance with these specifications and requirements.

B. The site representative of the environmental consultant is authorized by the owner to have free access to all asbestos work areas, to assist in interpretation of procedures, and to advise on provisions of the Contract Documents pertaining to the control of asbestos.

C. Site representatives of the environmental consultant may stop the asbestos abatement contractor’s work if in the course of performing their monitoring duties, they observe an instance of non-conformance with the contract documents and/or a situation presenting a health hazard to workers or owner employees. Work shall not resume until corrective measures have been carried out.

D. Any stop work orders issued by the owner or the environmental consultant pursuant to the above provisions will not be grounds for claims to be made by the contractor for damages caused by the associated delay, nor will it extend the contract completion date.

E. The environmental consultant will act as the owner's liaison in technical matters involving the asbestos related work.

F. The environmental consultant will perform air sampling in accordance with ICR-56 requirements during the project. The contractor shall cooperate fully with the consultant and ensure the cooperation of the contractor’s workers during collection of air samples and work area inspections.

G. The environmental consultant's role in advising the building owner on environmental health matters does not relieve the contractor's obligation to comply with all applicable health and safety regulations promulgated by the federal, state, and local governments. Air monitoring results generated by the environmental consultant shall not be used by the contractor to represent compliance with regulatory agency requirements for monitoring of

worker's exposure to airborne asbestos, nor shall any other activity on the part of the environmental consultant represent the contractor's compliance with applicable health and safety regulations.

H. When visual inspections or air monitoring are specified, the contractor shall notify the owner and the environmental consultant forty-eight hours, excluding weekends and holidays, in advance of the day and time when the contractor will be ready for such inspections or monitoring.

1.15 LICENSING AND CERTIFICATION

A. The contractor must hold a current, valid asbestos handling license issued by the Commissioner of Labor.

B. A copy of a valid asbestos contractor license shall be submitted with the bid.

C. A copy of the contractor’s license shall be conspicuously displayed proximate to but outside the work area during the duration of the project.

D. The contractor shall permit only those persons who hold valid asbestos handling certificates to engage in work on this project.

1.16 WORK AREA INSPECTIONS

A. The contractor shall request an inspection in writing to the environmental consultant/project monitor at least 48 hours in advance of the time the inspection is required. The contractor supervisor must conduct a thorough inspection of work area prior to requesting review by environmental consultant.

1. Work Area Preparation Inspection

a. After preparation of the work area and decontamination enclosure system(s), the project monitor shall conduct an inspection to review completeness of work and preparation as per the specification requirements.
b. No abatement operations shall commence without the approval of the project monitor following a work area preparation inspection.

2. First Clean Inspection

a. The environmental consultant shall conduct an inspection of all surfaces to verify the asbestos containing material has been removed and all surfaces in the work area have been wet cleaned using rags, mops, and sponges in accordance with ICR-56. Acceptability of this condition will be determined by the environmental consultant during the inspection.

3. Final Visual Inspection

a. After completion of the abatement operations, the environmental consultant shall inspect the work area to verify cleanliness of the area. Inspection will be completed following their abatement and cleaning as defined by the ICR-56. The work area and equipment must be free of all visible asbestos containing material, debris, dust and water.

1.17 NOTICE AND RECORD KEEPING

A. The contractor shall maintain for at least thirty (30) years, a record of each asbestos project in which the contractor engages. Such record shall include the following information: the name, address, and social security number of the person who shall supervise the asbestos project: the amount of asbestos or asbestos containing material that was installed, removed, enclosed, applied, encapsulated, or disturbed; the starting and completion date of the asbestos project; the name and address of the deposit or waste disposal site or sites where the asbestos waste material was deposited or disposed of; the name and address of any sites that were used for the interim storage of asbestos or asbestos waste materials prior to final deposit or disposal; the name and address of any transporters that were used to transport asbestos waste material; the name, address and social security number of all persons who were engaged in the asbestos project.

B. The contractor will provide a complete copy of the New York State required record of the project to the owner at the completion of the project.

1.18 EXISTING CONDITIONS

A. Before any site work begins, the contractor shall conduct a space by space inspection with a representative of the building owner, and prepare a written inventory of all existing damage in those spaces which may be impacted by the contractors work.

2.0 PART 2 - PRODUCTS

2.1 MATERIALS

A. Deliver all materials in original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

B. Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

C. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Materials that become contaminated shall be disposed of in accordance with applicable regulations.

D. Polyethylene flame retardant sheet of 6 mil thickness shall be used unless otherwise specified. Polyethylene sheeting shall be sized to minimize the number of joints.

E. Wherever framing and sheathing materials are necessary, the contractor shall provide minimum, 3/8" OSB sheeting or plywood, and metal or wooden 2" x 4" wall studs unless otherwise specified.

F. Waterproof tape shall be capable of sealing joints of adjacent sheet of polyethylene and for use in attachment of polyethylene sheet to finished or unfinished surfaces of similar materials and shall be capable of adhering under dry and wet conditions, including use of amended water.

G. Sealable polyethylene bags of 6 mil minimum thickness shall be used. Bags shall be sized to fit within drums specified below.

H. Sealable drums, if required, of 30 to 55 gallon capacity shall be of fiber, or metal, with tightly fitting lids. The drums and bags shall be labeled in accordance with OSHA or U.S. EPA requirements and shall be air and water tight.

I. Glove bags, in necessary, shall be 6 mil clear polyethylene, minimum size of 43" x 63", approved and labeled for removal and containment of asbestos containing material.

J. Provide spray adhesive for sealing polyethylene to polyethylene.

K. Provide protective devices such as, but not limited to, disposable clothing, respirators, gloves, hard hats, etc.

L. Wetting agent shall be a mixture of 50:50 polyoxyethylene ether and polyoxyethylene ester or equivalent commercially available product. Wetting agent shall be of low toxicity, non-carcinogenic and shall not be an eye, respiratory system or skin irritant.

2.2 ENCAPSULANT AND SEALANT

A. Where usage is applicable, encapsulant materials shall be a bridging and penetrating type with the following characteristics:

1. Encapsulant shall adhere to the substrate.
2. Encapsulant shall not be solvent-based or utilize a hydrocarbon in the liquid in which the solid parts of the encapsulant are suspended.
3. Encapsulant shall not be flammable.
4. Encapsulant shall be compatible with the anticipated asbestos replacement product.

B. A non-hardening lagging sealer for enclosing and sealing raw exposed edges and surfaces of asbestos containing materials.

C. Fire resistance sealants shall be compatible with concrete, metals, wood, cable jacketing, etc. Sealant shall prevent fire, smoke, water and toxic fumes from penetrating through sealants. Sealants shall have a flame spread, smoke and fuel contribution of zero, and shall be ASTM and UL rated for 3 hours for standard method of fire test for fire-stop systems.

D. Non-combustible expanding foam shall be used to seal penetrations in work areas unless otherwise specified.

2.3 TOOLS AND EQUIPMENT

A. Provide suitable tools for removal of asbestos containing roofing materials. Wire brushes and pressure washers shall not be used as a means of removing or cleaning asbestos containing materials from surfaces.

B. Provide sufficient number of HEPA-filtered vacuum cleaners equipped with wet pick-up adapters, steel floor wands, crevice tools, and carpet tools.

C. Airless sprayers capable of spraying amended water shall be provided in sufficient number to allow continuous uninterrupted work.

D. All air filtration devices shall utilize high efficiency particulate absolute (HEPA) filtration systems.

E. Transportation Equipment: Transportation equipment, as required, shall be suitable for loading, temporary storage, and unloading of contaminated waste without exposure to persons or property, and shall be quite in motion if used within the building.

F. Wastewater filtering system shall be a series of filters with decreasing rated pore size ending with a 5 micron filter(s). Filter media shall be of the disposable cartridge type and will be disposed of as ACM waste.

G. Power tools used to drill, cut, saw or otherwise disturb asbestos containing materials shall be equipped with HEPA filtered local exhaust ventilation.

H. Ladders and/or scaffolds for work performance and visitors: The contractor shall make available to authorized visitors, ladders and/or scaffolds of sufficient dimension and quantity so that all work surfaces can be easily and safely reached. All scaffold joints and ends shall be sealed with tape to prevent incursion of asbestos. Scaffolds and ladders shall comply with all applicable codes.

3.0 PART 3 - EXECUTION

3.1 UTILITIES

A. In coordination with owner/construction manager, ensure that all electrical power terminating in the work area, including but not limited to outlets and lights, are disconnected and cannot be re-energized during the course of the work. Ensure that all power lines which transit the work area and are necessary for the continued operation of services in areas outside the work area are identified, labeled and protected adequately in order not to pose a hazard to workers during the course of work.

B. Provide temporary power and lighting as necessary, and ensure safe installation of temporary sources and equipment per applicable electrical code requirements. Owner/construction manager will locate tie-in location. Provide waterproof safety lighting and incorporate ground fault interrupter circuits at power sources of all electrical equipment. Contractor is responsible for adequate power to perform contractor’s own work and necessary air monitoring equipment.

C. A location for water service will be made available by the owner. The contractor shall secure and maintain all hoses and connections in a leak-free state at all times.

D. The contractor shall be responsible for providing temporary water heaters during the project sufficient to provide hot water service to the decontamination chambers upon demand.

3.2 FIRE ALARM SYSTEMS

A. Fire alarm equipment, including smoke detectors, is to remain and shall be protected and decontaminated unless otherwise noted on contract drawings.

3.3 DECONTAMINATION ENCLOSURE SYSTEMS

A. Decontamination enclosure systems shall be constructed prior to preparation activities.

B. Personnel decontamination enclosure systems shall be provided outside the work area and attached to all locations where persons will enter or exit the work area. One system at a single location for each contained work area shall be required as a minimum. Decontamination facilities shall be constructed in accordance with New York State ICR-56, or per site specific variance approved for the project.

C. Enclosure Security: When the personnel decontamination enclosure system is situated near an area of public access, it shall be fully framed, sheathed for safety and constructed to prevent unauthorized entry.

D. Prefabricated or trailer units: All prefabricated or trailer decontamination units must be constructed or modified to meet all requirements of this specification and shall be completely decontaminated and sealed prior to separation and removal from the work area.

E. Location of decontamination enclosure systems must be approved by the owner/construction manager/environmental consultant prior to construction.

F. All decontamination enclosure systems shall be cleaned by the contractor after each work shift and shall be recorded in the project log by the contractor.

3.4 PRE-CLEANING

A. Pre-clean fixed objects within the work areas using HEPA filtered vacuum equipment and/or wet cleaning methods as appropriate.

3.5 MOVABLE OBJECTS

A. Movable objects within the work area shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Such objects shall be removed from the work area to an uncontaminated location designated by the owner/owner’s representative.

3.6 HVAC SYSTEMS

A. In coordination with owner/construction manager, shut down and isolate HVAC systems to prevent contamination and fiber dispersal to other areas of the building. Openings to all ducts, fans, louvers and plenums shall be sealed with two layers of 6 mil polyethylene sheeting prior to start of removal.

3.7 ELECTRICAL

A. All electrical conduit joints, boxes, devices and cable systems within the work area shall be sealed with tape and two layers of 6 mil polyethylene sufficient to prevent water penetration during asbestos abatement operations.

B. All loose cables and wiring present in any work area shall be supported so that they do not become disconnected or otherwise damaged during removal operations. Any damage to this wiring will become the responsibility of the contractor to repair at contractor's own expense.

3.8 MECHANICAL EQUIPMENT

A. All mechanical equipment within the work area shall be pre-cleaned and sealed with tape and two layers of 6 mil polyethylene sufficient to prevent water penetration during asbestos operations.

3.9 EMERGENCY EXITS

A. Maintain emergency and fire exits from the work areas.

B. A diagram of all emergency and fire exits must be prepared, and displayed in a conspicuous location in the clean room.

3.10 CRITICAL BARRIERS

A. Temporary isolation partition, louvers and fire dampers to air shafts, elevators and corridors, and other temporary critical barriers shall be constructed as follows:

1. Construct barriers of metal or wood studs and joists, maximum 16" o.c. with minimum 3/8" OSB sheathing or plywood on work side only unless otherwise noted.
2. Cover both sides of the framing with two layers of 6 mil polyethylene sheet with joints staggered and sealed with tape. Edges of partition at floor, walls, and ceiling shall be caulked airtight. Barrier shall be airtight.

B. Seal off all openings, including but not limited to corridors, doorways, ducts, grills, diffusers, pipe chases, drains, grates, and any other penetrations of the work areas, with two layers of polyethylene sheeting sealed with tape. Use caulking where necessary. Doorways which will not be used for passage during work must be sealed by first applying tape over the gap between the closed door and the door frame and the gap between the bottom of the door and the floor. Then apply polyethylene sheeting over the

door and seal it with tape to the wall and to the floor. Seal windows by applying two layers of polyethylene sheeting sealed independently to the wall with tape. All openings greater than 32 square feet (except where any one dimension is one foot or less) shall be sheathed and sealed in accordance with ICR56.

C. At any time during the abatement activities after barriers have been erected, if visible worksite debris is observed outside of the work area or damage occurs to barriers, work shall immediately stop. Repairs will then be made to barriers, and debris/residue shall be cleaned using appropriate HEPA vacuuming and wet cleaning procedures.

D. Daily inspection and smoke testing of all barriers shall be performed by the contractor and shall be recorded in the daily project log. These daily inspections shall occur prior to the start of a work shift and upon the completion of the same work shift. After the environmental consultant has reviewed the work area for decontamination enclosure, critical barriers and the polyethylene sheeting applications, a minimum of 4 hours settling period is required before abatement work activities will be allowed to commence.

3.11 FLOORS

A. All floors, except those specifically excluded by a project specific variance, will be covered with two layers of 6 mil polyethylene sheeting, extending a minimum of 12 inches up each wall. Polyethylene shall be sized to minimize seams. All seams within a layer shall be separated by a distance of at least six feet and sealed airtight.

B. All polyethylene layers will be sealed with tape at all joints and edges.

C. Adjoining sheets of polyethylene shall overlap each other by a minimum of 12 inches.

3.12 WALLS

A. All wall surfaces, except those specifically excluded by an applicable variance, shall be covered with polyethylene sheeting consisting of two layers of 6 mil thickness, sealed with tape at all joints and edges. Polyethylene shall be sized to minimize seams. All seams within a layer shall be separated by a distance of at least six feet and sealed airtight.

B. Adjoining sheets of polyethylene shall overlap each other by a minimum of 12 inches.

C. First layer of wall polyethylene will be installed between first and second layer of floor polyethylene. Second layer of wall polyethylene will overlap second layer of floor polyethylene.

D. Any glass broken by the contractor during abatement activities will be replaced at contractor’s expense.

3.13 CEILINGS

A. Ceiling surfaces, except those specifically excluded by an applicable or project specific variance, which will remain intact throughout the abatement process will be covered with

two layers of 6 mil polyethylene sheeting extending a minimum 12 inches down each wall. The first layer shall overlap the first layer of wall polyethylene; the second layer shall overlap the second layer of wall polyethylene.

3.14 DIFFERENTIAL AIR PRESSURE SYSTEMS

A. The work area shall maintain a minimum differential air pressure of -0.02 inches water gauge pressure relative to work site perimeters whenever the work is being performed, including removal, gross clean-up encapsulation of surfaces, and final air clearance air monitoring.

B. Differential air pressure shall be continuously monitored by the Contractor using a recording instrument equivalent to Dwyer Instrument Co., "Photohelic Gauge" connected to a circular chart recorder. Connect recording instrument to an audible alarm which will activate at pressure differential less than -0.02 inches water gauge air pressure. Defective or non-operating instrumentation will require temporary ceasing of work until instrumentation is replaced.

C. HEPA Exhaust Units: If more than one primary HEPA exhaust unit is installed, the units shall be turned on at a time and the integrity of wall barriers, for secure attachments or the need for additional reinforcement, shall be checked. Units connected in series shall be con-sidered a single unit for this test. A minimum of one additional unit, having a capacity at least equal to that of the primary unit, shall be installed as a backup to be used during prima-ry unit filter changing and upon primary unit failure.

D. Power Supply: The contractor shall be responsible for verifying the available power supply and providing supplemental power as necessary to satisfy the requirements of the total of all ventilating units. Ventilation units must be on separate circuits with independent circuit breakers. Building owner will provide existing power supply for contractor use.

E. Power Failure: On electric failure, abatement shall stop immediately and shall not resume until power is restored and exhaust units are operation fully. On extended power failure, longer than one hour, the decontamination facilities, after the evacuation of all persons from the work area, shall be sealed airtight.

F. Air Changes: HEPA exhaust ventilation equipment shall be installed and operated to provide at least four air changes in the work area every hour, or as required in ICR-56 or project specific variance. In calculating the exhaust equipment requirements, the full, rated capacity of the equipment shall not be used. A design capacity reduced to account for inefficiencies and duct losses will be used instead.

G. Openings in Enclosure: Openings made in the enclosure system to accommodate these units shall be made airtight with tape and/or caulking. Where possible, only the intake and the filter access panel shall remain within the work area to permit filter changing, while minimizing equipment contamination and the likelihood of contamination of non-work areas.

H. Installation and Care: Negative pressure HEPA filtered exhaust ventilation units shall be exhausted to the outside of the building or structure and away from occupied areas. Proper installation, air monitoring, and daily inspections shall be conducted to insure that the ducts do not release asbestos into uncontaminated areas. Fans, ducts, and joints shall comply with the following:

1. Ducts: Ducts of at least equivalent shape and dimension as that of the negative pressure ventilation exhaust shall be used to exhaust to the outside of the building or structure.
2. Airtight System: All fans, ducts, and joints shall be sealed, braced, and supported to maintain an airtight system.

I. Exhaust Location: At no time shall the negative pressure ventilation unit exhaust within 15 feet of a receptor or adversely affect the air intake of the building/structure or other buildings/structures.

3.15 MAINTENANCE OF WORK AREA BARRIERS

A. Pre-abatement Settling Period: Upon completion of the construction of all plastic barriers and decontamination system enclosures and prior to beginning actual abatement activities, a four (4) hour settling period shall be allowed to insure that barriers will remain intact and secured to walls and fixtures.

B. Inspection of Barriers: All plastic barriers inside the work area, in the personal decontamination enclosures system, in the waste decontamination enclosure system, and at partitions constructed to isolate the work area from occupied areas, shall be inspected by the asbestos contractor supervisor at least twice daily. The barriers shall be inspected before the start of and following the completion of a day's abatement activities. Inspections and observations shall be documented in a daily project log.

C. Repairs to Barriers and/or Enclosure Systems: Damage and defects in the barriers and/or enclosure systems shall be repaired immediately upon discovery and prior to resumption of abatement activities.

D. Testing of Barriers and Enclosures Systems: With the negative air pressure ventilation units in operation, smoke tubes shall be used to test the effectiveness of the work area barriers and the personal and waste decontamination enclosure systems. These tests shall be performed prior to the beginning of abatement activities and at least once a day thereafter until satisfactory clearance air monitoring results have been achieved. Test results, observations, and any modifications shall be documented in a daily project log.

E. Loss of Enclosure Integrity: At any time during the abatement activities, if visible emissions are observed outside of the work area, or if damage occurs to the barrier, work shall immediately be stopped, repairs made, and visible residue immediately cleaned up using HEPA vacuuming and/or wet cleaning methods prior to the resumption of abatement activities.

F. Daily Cleaning of Enclosures: The contractor shall HEPA vacuum and/or wet clean the waste decontamination enclosure system.

3.16 EQUIPMENT AND MATERIAL REMOVAL PROCEDURES

A. Clean external surfaces of ACM bags or containers, materials, and equipment thoroughly by wet sponging or HEPA vacuuming before moving such items into the equipment decontamination enclosure system washroom for final cleaning and removal to uncontaminated areas. Equipment, materials, and containers shall be free of all visible debris and dust. No items shall be removed from the work area without first notifying the environmental consultant or building owner. All items shall be subject to inspection by the environmental consultant who will designate items requiring further decontamination of visible debris and dust. Ensure that personnel do not leave the work areas through the equipment decontamination enclosure.

3.17 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. Dry Removal or Disturbance: No dry removal or disturbance of asbestos containing materials shall be permitted.

B. Wetting Requirements: The asbestos containing material shall be wetted frequently with amended water using airless sprayers. Sufficient time shall be allowed for penetration to occur prior to abatement activities. All friable materials shall be saturated. All non-hygroscopic asbestos containing material (e.g., amosite) shall be thoroughly wetted on a continuous basis.

C. Handling: Asbestos containing material on detachment from the substrate shall be directly bagged or dropped into a flexible catch basin and subsequently bagged. Asbestos containing material may not be dropped distances greater than ten feet.

D. Chutes: Where asbestos containing material must be dropped distances greater than ten feet, inclined, dust tight, enclosed chutes shall be used.

E. Handling Large Components: Large components, removed intact, shall be wrapped in two layers of at least six mil plastic sheeting, secured, and made airtight with tape.

F. Sharp-edged Components: Asbestos waste material with sharp-edged components that may tear the plastic bags or sheeting shall be placed into hard wall containers and sealed airtight.

3.18 REMOVAL OF PIPE AND PIPE FITTING INSULATION

The contractor shall be responsible for the removal of all ACM friable and non-friable pipe insulation within the containment boundaries as specified. The procedure to follow is to be used as a general guideline only. The contractor shall be responsible for methods and sequences to perform the work.

A. Pipe and Fitting Insulation Removal (Chases): Regulated work areas shall be contained and negative pressure differential established. Contractor shall carefully demolish chase walls, on designated side, completely from floor to deck. Penetrations to the floor below or above shall be thoroughly cleaned of ACM insulation, if present, and sealed with

expanding foam or similar material prior to abatement of insulations. Locations where exposed ends of ACM insulation are to remain shall be sealed with wettable wrap/lag cloth. All locations of remaining ACM insulation shall be appropriately labelled.

B. Pipe and Fitting Insulation Removal (Crawlspace): Contractor shall establish a regulated work area within the crawlspace as determined from asbestos removal drawings. With HEPA exhaust equipment operational, abatement and cleaning shall be performed. Penetrations to the floor below or above shall be thoroughly cleaned of ACM insulation, if present, and sealed with expanding foam or similar material.

C. Locations of minor size incidental disturbance areas, if present, have been designated. The immediate area all floor surfaces within ten feet of the anticipated work area containment shall be cleaned of all visible debris. Decontamination units shall be available for this work. Following cleaning of the floor, the containment shall be constructed for removal activities.

D. The contractor shall be responsible for maintenance of work area barriers and ventilation systems required by ICR-56. Visible ACM and suspect ACM debris shall be thoroughly wetted and removed from work area. Non-ACM items and insulation present throughout the space shall be removed and decontaminated within the waste decontamination system and removed from the building. The contractor shall be responsible for methods and sequences to perform the work. Any barrier installed separating the subject area from the remainder of the crawlspaces shall be framed prior to plasticizing.

E. Following all abatement and decontamination work, the entire work area shall be subject to first cleaning in accordance with ICR-56 requirements. Existing polyethylene sheeting on the floor of the crawlspace shall be removed and disposed of as ACM contaminated waste. Soil floor surfaces within the area shall be thoroughly inspected and cleaned throughout the space. All material found in the soil shall be thoroughly wetted and placed into disposal bags for removal from work area.

3.19 REMOVAL OF CAULK AND SEALANTS

This contract includes the removal and disposal of caulk, glazing compounds, and sealants as follows:

A. Contractor shall remove and dispose of all caulking and sealants at areas designated on contract drawings. Materials shall be removed utilizing manual methods.

B. If required during the course of abatement work to access and completely remove ACM caulking, the contractor shall be responsible for removal of door frames, window frames, panels, and unit ventilator louvers. Coordinate with owner’s representative salvage or disposal requirements of individual components.

C. Work shall include provision of a temporary critical barrier installed parallel to existing unit opening and shall be framed, sheathed, and covered with two layers of six mil flame retardant polyethylene at a minimum. Contractor shall coordinate removal work with contractor responsible for new installation and owner’s representative. Contractor shall be responsible for the weather tight and secure integrity of the critical barrier installed.

3.20 REMOVAL OF ACM FROM DUCTWORK

A. ACM materials present on HVAC ductwork include: asphalt sealant on fiberglass insulation, tan seam sealant on joints, and adhesive on insulation anchor pins.

B. Contractor shall be responsible for removal and disposal of insulation present on air handling units and ductwork indicated on Contract Drawings. Removal shall include insulation anchors and adhesive mastic for anchors present on remaining duct surfaces and seam sealant on duct seams and joints. Contractor is responsible for any Variance deemed necessary to perform abatement work in an efficient manner.

C. Contractor is responsible for selective demolition necessary to access ductwork for abatement. Demolition to be performed under containment conditions.

3.21 REMOVAL OF ACM CEILING MASTIC

A. Following establishment of the regulated work area Contractor will need to install critical barriers from floor level to ceiling level.

B. Within the work area, critical barriers and floor/wall plasticizing shall then be performed to the bottom of the ceiling system.

C. Once the work area is prepared, the perimeter ceiling tiles are to be removed. Any remaining opening above the ceiling level shall then be sealed as prescribed by NYSDOL ICR-56, subpart 11.7 requirements prior to phase IIB abatement.

D. Ceiling mounted fixtures, if present, shall either be removed, cleaned, and turned over to the owner or disposed of as ACM during the course of the work.

3.22 DAILY CLEANING

A. Asbestos containing debris and contaminated water shall be cleaned from the work area daily or after each work shift using wet methods and HEPA vacuuming equipment. Asbestos debris and water shall be placed in bags, sealed, and either stored or removed from the work area.

B. Worker decontamination enclosure system, clean room, shower, and equipment room shall be cleaned daily. Clean room floor shall be kept dry and free of any waste.

3.23 ENCAPSULATION

A. Where applicable, encapsulation shall commence in accordance with ICR-56 upon completion of the following:

1. All ACM has been removed, properly contained, and removed from the work area.
2. Contractor has cleaned up the work site of all loose debris and water and disposed of it as ACM.
3. Apply to the entire layer of polyethylene sheeting, both walls and floor.

4. Apply to all surfaces that were not the subject of removal or other remediation activities, excluding mechanical equipment, devices, gauges, valves, junction boxes, electrical equipment panels, etc. Surfaces to be encapsulated include walls, deck, above-ceiling surfaces in work areas, interior of wall chases, and open concrete block walls.

3.24 EQUIPMENT/WASTE REMOVAL PROCEDURES

A. Large Asbestos Projects

1. First Cleaning: External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the work area before moving such items into the waste decontamination enclosure system washroom by persons assigned to this duty. These work area persons shall not enter the airlock between the washroom and the holding room.
2. Second Cleaning: Once in the waste decontamination enclosure system, external surfaces of contaminated containers and equipment shall be cleaned of all visible debris, asbestos or otherwise, by wet cleaning.
3. Re-containerizing: The cleaned containers of asbestos containing material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated plastic bags or sheeting as the item's physical characteristics demand, and sealed airtight by workers in the holding room. Workers in the holding room may not enter the washroom area.
4. Removal to Airlock: The clean re-containerized items shall be moved into the holding area. The washroom persons shall not enter this airlock. Workers shall exit the waste decontamination system through the work area and personnel decontamination system.
5. Removal to Holding Area: Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered form uncontaminated areas.
6. Holding Carts: The cleaned containers of asbestos containing material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
7. Enclosure Security: The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry during non-work hours.
8. Enclosure Restrictions: Where the waste removal enclosure is part of the personal decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied.

3.25 HANDLING ASBESTOS CONTAMINATED WASTE

A. Handling of Contaminated Water

Contaminated water from the work area shall not be disposed of in the shower room. Contaminated water must be filtered through a separate 5.0 micron filter into a sanitary drain.

1. All water from any asbestos abatement work area including shower waste will be filtered through a series of filters (min. 3) to a filter having a maximum rated pore size of 5 micrometers (um) before being discharged. Used filters will be disposed of as ACM waste.
2. A holding tank located inside the work area is recommended in case the capacity of the filter is exceeded during active periods such as showering out.
3. All wastewater shall be discharged in an approved manner. No wastewater discharge will be allowed to enter a storm sewer, open drainage basin, small body of water, an individual residential drywell or septic system, or as owner requests.
4. Contractor shall be responsible for acquiring and all cost of any wastewater discharge permit, if required.

3.26 FINAL CLEANING AND CLEARANCE

A. Removal of Waste: All containerized waste shall be removed from the work area and the holding area.

B. Removal of Tools and Equipment: All tools and equipment shall be removed from the work area and decontaminated at an appropriate time in the final cleaning sequence.

C. The Contractor shall perform a complete visual inspection of the work area under adequate lighting to ensure the work area is free of visible asbestos containing material, debris and dust.

D. The Environmental Consultant shall verify the cleanliness of the work area by conducting a final clearance inspection. If any visible asbestos containing material, debris, dust or water are found in the work area, the contractor shall repeat the final cleaning process as prescribed herein.

E. Clearance air sampling by PCM will be performed in each area using aggressive air sampling techniques unless otherwise noted or directed. Air samples will be analyzed by PCM. The samples must show airborne concentrations of total fibers below 0.01 fibers per cubic centimeter (f/cc), or the background level, whichever is greater.

F. Following successful PCM clearance sampling results, Transmission Electron Microscopy (TEM) final clearance sampling will be conducted where applicable. Samples will be analyzed by Transmission Electron Microscopy (TEM).

G. If final clearance aggressive air sampling does not demonstrate compliance with the clearance criteria, the work area shall be re-cleaned. The aggressive sampling technique shall then be repeated.

H. If final clearance air sampling meets the clearance criteria and the critical barriers, decontamination enclosure systems and air exhaust systems shall be removed.

1. All polyethylene sheeting and HEPA filters shall be disposed of as asbestos waste.

I. After the contractor has completely removed equipment and materials from the work area, the owner, environmental consultant and contractor shall conduct an inspection of the area to ensure it is in an acceptable condition.

3.27 TRANSPORTATION AND DISPOSAL OF ASBESTOS WASTE

A. The contractor shall ensure that the asbestos waste is transported to the approved waste disposal site. The sealed bags and or containers shall be deposited at the burial site.

B. Waste Manifest System

1. The contractor shall establish a manifest system (chain of custody) that accounts for all asbestos waste. The manifest system shall be described in writing and will be subject to the approval of the environmental consultant. The contractor must be able to demonstrate custody over all asbestos waste from the time it is removed from the work area until it is deposited at the landfill. The contractor must complete the Asbestos Waste Shipment Record for all waste shipped off site.
2. Copies of the manifest, written description, and any receipts generated during the handling and disposal process shall be provided to the environmental consultant and the owner.
3. Final manifest and landfill receipt shall be provided to the environmental consultant and owner within fifteen (15) working days of the removal of asbestos containing materials from the site by the waste hauler.

C. It is the responsibility of the contractor to comply with current Federal, State, and local regulations concerning the waste handling, transportation, and disposal of ACM.

D. The contractor will document actual disposal of the waste at the designated landfill by maintaining waste shipment records for each shipment in accordance with EPA NESHAPS 40 CFR 61.

E. Vehicles used to transport asbestos waste must be marked during loading and unloading of waste so that signs are visible. The makings must conform to EPA NESHAPS requirements.

F. Vehicles used to transport containerized asbestos waste must have an enclosed carrying compartment or utilized a covering sufficient to contain waste and prevent damage to containers.

G. The carrying compartment of asbestos waste transport vehicles must be lined with polyethylene sheeting to contain leakage of asbestos waste should containers be damaged during transport.

3.28 RESTORATION AND REPAIRS

A. The contractor shall replace, repair, and paint surfaces distributed by contractor’s work, which are intended to remain, even if the work is outside the contract limit lines. Replacement and repair shall be with like material, and shall restore services as they existed prior to the work.

B. Where existing paint has been damaged or removed from the wall, contractor shall remove all loose finish and dirt, feather edge and sand all rough surfaces, and repaint the exposed surface with both a prime and finish coat(s) to match the existing surface.

C. All adjacent finishes and work shall be protected during the touch-up painting.

D. Contractor shall clean all exposed finish surfaces that have adhesive and tape residue left and any encapsulant overspray. Damage during these procedures will be repaired by the contractor at no cost to the owner.

E. The contractor shall repair any other surfaces and/or building component system and equipment that was disturbed by contractor's work, even if the work is outside the contract limit lines at no cost to the owner.

3.29 PROJECT CLOSEOUT

A. Prior to the final payment, and before the issuance of a final certificate for payment in accordance with the provisions of the Contract Documents, contractor shall comply with the requirements set forth herein.

B. The work under this section shall include but is not limited to the execution of the following principal items as they apply to Prime Contractor(s) for Project Closeout:

1. Consent of surety for final payments.
2. Submittal of EPA waste shipment record forms signed by the contractor, transporter, and landfill operator for each shipment of asbestos waste.
3. Complete project record including sign-in sheets, daily logs, and data generated by negative pressure recording instruments for each day of asbestos abatement.
4. Assurance, satisfactory to the owner that unsettled claims will be settled and that work not actually completed and accepted will be completed without any undue delay.
5. Guaranties, Warranties and Bonds required by the General Conditions and any other extended guaranties or warranties stated in the Technical Sections of the Specifications.
6. Temporary facilities, services, surplus materials, rubbish and similar appurtenances have been removed and/or restored.

END OF SECTION

SECTION 028300 - REMOVAL AND HANDLING OF LEAD-BASED PAINT

1.0 PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. Renovation activities for the completion of work at the buildings included in this project will disturb LBP creating the potential for lead exposure to workers and building occupants. Said work shall comply with the conditions specified herein. The Occupational Safety and Health Administration (OSHA) regulates occupational exposure to lead under 29 CFR 1926.62, the Lead in Construction Standard. Any contractor disturbing painted surfaces shall comply with all the requirements of 29 CFR 1926.62 and this specification. The intent is for the contractor to protect contractor's workers and building occupants from exposure to lead during renovation activities that disturb LBP. Contractors must also comply with the provisions of the US Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (June 1995) as specified by the New York State Department of Education in 8 NYCRR 155 as applicable.

B. The intent is for each Prime Contractor to address LBP impacting the contractor's scope of work. Provide labor, materials, tools, equipment and services necessary to protect workers and building occupants from lead exposure.

C. New York State Department of Environmental Conservation (NYSDEC) requires that lead containing loose and peeling paint, be disposed of as either industrial or hazardous waste, based upon results of a Toxicity Characteristic Leaching Procedure (TCLP) Test. Loose and peeling paint cannot be treated as construction and demolition debris. Contractor shall assume that all paint requiring removal is a hazardous waste and base his bid accordingly. Contractor is responsible for all laboratory analyses and costs required for waste disposal.

D. Contractor shall assume for purposes of bidding that all paint requiring removal is a hazardous waste and base the contractor's bid accordingly. Contractor is responsible for all laboratory analyses and costs required for waste disposal.

E. Work disturbing LBP shall be completed ancillary to other work performed and is to be coordinated with the construction manager. Exact quantities of paint to be addressed shall be determined by the contractor at the time of bidding. Contractor must satisfy themselves as to the quantity of material requiring removal and disposal.

F. Waste material shall be contained, transported and disposed of in accordance with federal and state regulations.

G. A survey of painted surfaces has been conducted. The report can be reviewed at the end of this Section.

1.2 APPLICABLE REGULATIONS

A. The Contractor shall conduct work in a manner to ensure compliance with all applicable codes, rules, and regulations including but not limited to;

Worker Protection / Building Occupant Protection

Occupational Safety and Health Administration
29 CFR 1926.59, Hazard Communication
29CFR 1910.134, Respiratory Protection Standard
29 CFR 1926.20, General Safety and Health Provisions
29CFR 1926.62, Lead Exposure in Construction
29CFR 1910.94 and 1926.57, Ventilation

Department of Housing and Urban Development
24 CFR Parts 35, 36, 37- HUD Lead-Based Paint Regulations
HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

Ambient Air Quality

Environmental Protection Agency
40 CFR 50.6 National Primary and Secondary Ambient Air Quality Standards for Particulate Matter

Water Quality

40 CFR 122, Administered Permit Programs; The National Pollutant Discharge Elimination System

Waste Disposal

40 CFR 261, Identification and Listing of Hazardous Waste
40 CFR 262, Standards Applicable to Generators of Hazardous Waste
40 CFR 263, Standards Application to Transporters of Hazardous Waste
New York State Department of Environmental Conservation (NYSDEC), Title 6, Part 363-7, 364, and 370-374.

B. In addition to the requirements listed in this specification, the applicable contractor shall, at the contractor's own cost and expense, comply with all laws, ordinances, rules, and regulations of federal, state, regional and local authorities regarding handling and storing of lead waste material.

C. Contractor shall be familiar with the documents referenced below and conform to their guidelines and all other applicable guidelines and requirements of the project.

1. U.S. Department of Labor, Occupational Safety and Health Administration PUB 3126 - Working with Lead in the Construction Industry.
2. U.S. Department of Housing and Urban Development- Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, June 1995.

D. If required, Lead Abatement Contractor shall possess the following license and licensed personnel, as applicable, for work considered lead abatement according to 40 CFR 745.

1. Environmental Protection Agency (EPA) Firm Certification to Conduct Lead-Based Paint Activities.
2. Personnel possessing EPA Certifications in Lead-Based Paint Abatement Supervisor and Lead-Based Paint Abatement Worker, as applicable.

E. EPA Renovation, Repair, and Painting

1. This regulation applies only to child (less than 6 years of age) occupied facilities constructed before 1978. Affected painted surfaces must contain **1.0 mg/cm^2 or greater** lead content to be covered by this regulation. Additionally disturbances of less than 6 sq.ft. per room interior and 20 sq.ft. exterior are excluded.

1.3 LEAD HAZARD

A. Specific work practices may release lead in the form of dust, fumes or mists into the air or onto surrounding surfaces. Only the contractor can reduce the potential for exposure.

B. Lead is a toxic substance which may enter the body by breathing or swallowing lead dusts, fumes or mists. If food, cigarettes, or a person's hands have lead on them, lead may be ingested or inhaled. Once in the body, lead enters the bloodstream and may be carried to all parts of the body. The body can eliminate some of this lead, but if there is continued lead exposure, the body absorbs and stores more lead than it can eliminate. This stored lead may cause irreversible damage to cells, organs and whole body systems. After exposure stops, it takes months or even years for all lead to be removed from the body.

C. Exposure to lead may affect each person differently. Even before symptoms appear, lead may cause unseen injury to the body. During early stages of lead poisoning, mild symptoms may be overlooked as everyday medical complaints, including:

Loss of appetite	Joint and muscle aches
Trouble sleeping	Metallic taste
Irritability	Decreased sex drive
Fatigue	Lack of concentration
Headache	Moodiness

D. Brief intense exposure or prolonged overexposure may result in severe damage to blood-forming, nervous, urinary and reproductive systems. Some noticeable medical problems include:

Stomach pains	Tremors
Weakness of Extremities	Convulsions or seizures

High blood pressure	Anemia
Nausea	Constipation or diarrhea

E. Contractor's supervisor should be cognizant of all these symptoms. If a worker develops such symptoms he shall not be allowed in the removal areas until a physician performs blood lead sampling and determines that the worker is not suffering from lead exposure.

1.4 GENERAL REQUIREMENTS

A. The following general requirements apply for the project and include, but are not necessarily limited to the following:

- Respiratory and Personnel Protection
- Medical Examinations
- One Temporary Shower/Washroom Facility with storage area for personnel belongings
- Provisions of hot and cold running water for shower
- Use of engineering controls as necessary
- Collection and disposal of all loose and peeling paint as hazardous waste

2.0 PART 2 - SUBMITTALS

2.1 PRE-WORK

A. Prior to the start of construction, the contractor shall submit the following should the contractor’s work require the disturbance of identified LBP materials.

B. WORKPLAN: Contractor shall submit a work plan for the lead work commensurate with the requirements of the OSHA Construction Standard and EPA, if applicable. Work plan shall additionally identify detailed aspects of how the contractor will handle, containerize, transport, and dispose of materials.

C. EQUIPMENT: Submit manufacturer’s certification and information for all equipment to be used on this project.

D. EMPLOYEES: Submit documentation that all employees performing abatement of lead materials have received appropriate medical examinations and have successfully passed a fit test for the respirator to be worn. Submit documentation that contractor and employees comply with Article 1.02, Item C. of this section.

E. DISPOSAL: Submit documentation that all required permits, disposal site locations, and arrangements for transportation and disposal of lead-contaminated waste have been obtained. Submit a written description and blank log forms for contractors waste manifest system. Submit the name and credentials for the independent laboratory performing TCLP testing on waste generated.

F. SIGNAGE: Submit samples of signs to be used at building entrances to comply with specifications and applicable regulations.

3.0 PART 3 - EXECUTION

3.1 BUILDING ISOLATION AND SIGNAGE

A. Only the Contractor, Owner representatives and maintenance staff will be allowed in the areas where lead removal is occurring. Anyone entering the work area will don appropriate respiratory protection and disposable coveralls.

B. Warning signs shall comply with 29 CFR 1926.62 and applicable regulations.

3.2 REMOVAL OF LEAD

A. Contractors will be required to remove all loose and peeling paint from surfaces impacted by the demolition/renovation activities that have been identified as LBP. The contractor shall investigate conditions and understand the extent of work required prior to bidding. Contractor shall ensure the paint that remains on the affected component is sufficiently adhered to the substrate.

B. Removal of all paint and primer is required at locations on structural members and all steel building components where welding, grinding, or torch cutting will be required. Removal and handling shall be in accordance with the requirements of this Section.

C. Removal and demolition of glazed block and ceramic tile may impact lead containing coatings. Debris generated from this work will require TCLP testing for determination of proper disposal procedures.

D. Following removal of paint and disturbance or removal of the affected component, Contractor shall be responsible for properly cleaning the affected area. All dust generated shall be cleaned utilizing HEPA filtered vacuum equipment followed by wet cleaning. Debris generated during cleaning including mop heads, rags, and waste water shall be containerized for testing and disposal.

3.3 HANDLING AND DISPOSAL OF LEAD

A. Hazardous Waste

1. Contractor shall follow all Federal and State regulations for waste handling, containerizing, transporting, and disposing of hazardous waste.
2. Contractor shall remove paint waste from the building following specification requirements. Waste shall be deposited directly into waste receptacles that will be used to transport the waste.
3. Contractor is responsible for providing all waste receptacles required for disposal. All waste temporarily stored on site shall be secured to prevent against unauthorized entry and vandalism. Contractor is responsible for all TCLP testing to properly classify the waste.
4. The Contractor shall establish a manifest system that meets Federal and State Regulations and accounts for all waste at all times.
5. The transporter must possess an approved EPA identification number. The appropriate NYS Hazardous waste manifest must be completed by the contractor.

6. The Contractor shall provide the Owner with copies of the EPA ID number of the transporter, NYSDEC manifest form and written acknowledgement from the landfill that they are authorized by the EPA and the State where they are located, to accept and dispose of hazardous waste.
7. Final manifest and receipts must be provided to the Owner and/or Owner's representative within fourteen (14) days of the removal of waste from the site.

3.4 PROJECT CLOSEOUT

A. Prior to final payment, and before the issuance of a final certificate for payment in accordance with the provisions of the contract documents, Contractor shall comply with the following.

1. Contractor shall provide Building Owner with a written statement that loose and peeling paint has been removed from the required areas.
2. Provide copies of a physician's statement that workers pre-abatement and post-abatement medical tests have been performed. Also provide copies of *all* laboratory reports for air sampling and TCLP analyses.
3. Final disposal receipts for all waste.
4. Contractor shall have removed all equipment and materials applicable to the work from the site.

END OF SECTION

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

CNS Allen Road Elementary
803 Allen Road
N Syracuse, NY 13212

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/15/2024

1/15/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: CNS Allen Road Elementary School
803 Allen Road
N Syracuse, NY 13212

Dear Ron:
On January 8, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 803 Allen Road, N Syracuse, NY 13212

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

Metal: Ceiling I-Beam (2) Support Post (4)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



SK-1 ALLEN ROAD ELEMENTARY SCHOOL – FIRST FLOOR PLAN
Scale: 3/32" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/8/2024 18:50	Calibration	Pass	1.1
2	1/8/2024 18:50	Calibration	Pass	1.1
3	1/8/2024 18:51	Calibration	Pass	1.1
4	1/8/2024 18:53	Calibration	Pass	1.1
70	1/8/2024 18:55	Calibration	Pass	1.1
71	1/8/2024 18:55	Calibration	Pass	1
72	1/8/2024 18:55	Calibration	Pass	1
73	1/8/2024 18:57	Calibration	Pass	1
314	1/8/2024 18:58	Calibration	Pass	0.9
315	1/8/2024 18:58	Calibration	Pass	1
316	1/8/2024 18:58	Calibration	Pass	1
317	1/8/2024 18:58	Calibration	Pass	1
318	1/8/2024 18:58	Calibration	Pass	0.8
319	1/8/2024 18:59	Calibration	Pass	0.8
320	1/8/2024 18:59	Calibration	Pass	0.9
321	1/8/2024 18:59	Calibration	Pass	0.8
380	1/8/2024 19:00	Calibration	Pass	0.9
381	1/8/2024 19:00	Calibration	Pass	0.8
382	1/8/2024 19:00	Calibration	Pass	0.9
383	1/8/2024 19:01	Calibration	Pass	0.9
384	1/8/2024 19:01	Calibration	Pass	0.9
385	1/8/2024 19:01	Calibration	Pass	0.8
386	1/8/2024 19:02	Calibration	Pass	0.9
387	1/8/2024 19:02	Calibration	Pass	0.9
388	1/8/2024 19:02	Calibration	Pass	0.8
513	1/8/2024 19:05	Calibration	Pass	0.9
514	1/8/2024 19:05	Calibration	Pass	0.9
515	1/8/2024 19:05	Calibration	Pass	0.9
516	1/8/2024 19:05	Calibration	Pass	0.9

Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Bar Joist	5	100.00%	0	0.00%	5	100.00%
2	Ceiling	8	100.00%	0	0.00%	8	100.00%
3	Ceiling I-Beam	0	0.00%	2	100.00%	2	100.00%
4	Door	4	100.00%	0	0.00%	4	100.00%
5	Door Unit	17	100.00%	0	0.00%	17	100.00%
6	Electrical Panel	1	100.00%	0	0.00%	1	100.00%
7	Locker	3	100.00%	0	0.00%	3	100.00%
8	Radiator	2	100.00%	0	0.00%	2	100.00%
9	Support Post	1	20.00%	4	80.00%	5	100.00%
10	Unit Ventilator	3	100.00%	0	0.00%	3	100.00%
11	Wall	62	100.00%	0	0.00%	62	100.00%
12	Window Unit	12	100.00%	0	0.00%	12	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
405		2	Wall 3	Support Post	Metal	Green	Positive	1.8
419		4	Wall 1	Support Post	Metal	Green	Positive	1.3
435		6	Wall 2	Support Post	Metal	Green	Positive	2
443		6	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	2
444		7	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	1.6
463		10	Wall 1	Support Post	Metal	Green	Positive	3.8

XRF Results

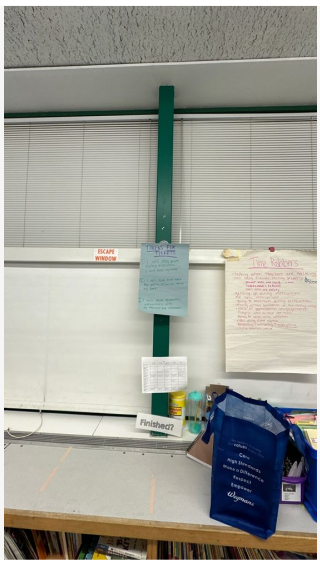
XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
389		1	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
390		1	Wall 1	Wall	Tile	White	Negative	0
391		1	Wall 2	Wall	Tile	White	Negative	0
392		1	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
393		1	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
394		1	Wall 3	Wall	Tile	White	Negative	0
395		1	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0.2
396		1	Wall 3	Ceiling	Tile	Green	Negative	0
397		1	Wall 3	Ceiling	Tile	Blue	Negative	0
398		1	Wall 3	Door Unit	Metal	Green	Negative	0.1
399		1	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
400		1	Wall 4	Wall	Tile	White	Negative	0
401		2	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
402		2	Wall 1	Door Unit	Metal	Green	Negative	0
403		2	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
404		2	Wall 3	Window Unit	Metal	Green	Negative	0
405		2	Wall 3	Support Post	Metal	Green	Positive	1.8
406		2	Wall 4	Wall	Plaster-Gypsum	Blue	Negative	0
407		2	Wall 4	Ceiling	Plaster-Gypsum	Blue	Negative	0.1
408		3	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.2
409		3	Wall 1	Door Unit	Metal	Green	Negative	0
410		3	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
411		3	Wall 1	Wall	Tile	White	Negative	0
412		3	Wall 2	Wall	Tile	White	Negative	0
413		3	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.2
414		3	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
415		3	Wall 3	Wall	Tile	White	Negative	0
416		3	Wall 4	Wall	Tile	White	Negative	0
417		3	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
418		4	Wall 1	Window Unit	Metal	Green	Negative	0
419		4	Wall 1	Support Post	Metal	Green	Positive	1.3
420		4	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
421		4	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
422		4	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
423		4	Wall 3	Door Unit	Metal	Green	Negative	0.1
424		4	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
425		5	Wall 2	Window Unit	Metal	Green	Negative	0
426		5	Wall 2	Window Unit	Metal	Green	Negative	0
427		5	Wall 2	Wall	Wood	Unpainted	Negative	0
428		5	Wall 2	Door Unit	Metal	Green	Negative	0
429		5	Wall 2	Door	Metal	Green	Negative	0
430		6	Wall 2	Wall	Tile	White	Negative	0
431		6	Wall 2	Wall	Tile	Blue	Negative	0
432		6	Wall 2	Radiator	Metal	Gray	Negative	0
433		6	Wall 2	Window Unit	Metal	Green	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
434		6	Wall 2	Window Unit	Metal	Green	Negative	0
435		6	Wall 2	Support Post	Metal	Green	Positive	2
436		6	Wall 2	Door Unit	Metal	Green	Negative	0
437		6	Wall 2	Door	Metal	Green	Negative	0
438		6	Wall 3	Wall	Tile	White	Negative	0
439		6	Wall 4	Wall	Tile	White	Negative	0
440		6	Wall 4	Door Unit	Metal	Green	Negative	0
441		6	Wall 4	Bar Joist	Metal	Black	Negative	0
442		6	Wall 4	Bar Joist	Metal	Black	Negative	0
443		6	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	2
444		7	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	1.6
445		7	Wall 4	Bar Joist	Metal	Black	Negative	0
446		7	Wall 1	Window Unit	Metal	Green	Negative	0
447		7	Wall 1	Door Unit	Metal	Green	Negative	0
448		7	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
449		7	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
450		7	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
451		7	Wall 3	Wall	Tile	White	Negative	0
452		7	Wall 4	Wall	Tile	White	Negative	0
453		8	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
454		8	Wall 1	Door Unit	Metal	Green	Negative	0
455		8	Wall 1	Door	Metal	Green	Negative	0
456		8	Wall 2	Unit Ventilator	Metal	White	Negative	0.1
457		8	Wall 2	Wall	Brick	White	Negative	0
458		8	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
459		8	Wall 3	Door Unit	Metal	Green	Negative	0
460		8	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
492		9	Wall 1	Radiator	Metal	White	Negative	0
493		9	Wall 1	Window Unit	Metal	Green	Negative	0
494		9	Wall 1	Window Unit	Metal	Green	Negative	0
461		10	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
462		10	Wall 1	Window Unit	Metal	Green	Negative	0
463		10	Wall 1	Support Post	Metal	Green	Positive	3.8
464		10	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
465		10	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
466		10	Wall 3	Door Unit	Metal	Green	Negative	0
467		10	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
468		11	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
469		11	Wall 1	Wall	Tile	White	Negative	0
470		11	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.1
471		11	Wall 1	Door Unit	Metal	Green	Negative	0.1
472		11	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
473		11	Wall 2	Wall	Tile	White	Negative	0
474		11	Wall 3	Wall	Tile	White	Negative	0
475		11	Wall 3	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
476		11	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
477		11	Wall 4	Wall	Tile	White	Negative	0
478		12	Wall 1	Wall	Tile	White	Negative	0
479		12	Wall 1	Door Unit	Metal	Green	Negative	0.1
480		12	Wall 1	Electrical Panel	Metal	Green	Negative	0
481		12	Wall 3	Locker	Metal	Green	Negative	0
482		12	Wall 3	Locker	Metal	Green	Negative	0
483		12	Wall 3	Locker	Metal	Green	Negative	0
484		12	Wall 3	Door Unit	Metal	Green	Negative	0.1
485		12	Wall 3	Wall	Tile	White	Negative	0
486		12	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
487		12	Wall 3	Unit Ventilator	Metal	White	Negative	0
488		12	Wall 3	Wall	Brick	White	Negative	0
489		12	Wall 4	Door Unit	Metal	Green	Negative	0
490		12	Wall 4	Door	Metal	Green	Negative	0
491		12	Wall 4	Bar Joist	Metal	Black	Negative	0
495		13	Wall 1	Wall	Tile	White	Negative	0
496		13	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
497		13	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
498		13	Wall 2	Wall	Tile	White	Negative	0
499		13	Wall 3	Wall	Tile	White	Negative	0
500		13	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
501		13	Wall 3	Door Unit	Metal	Green	Negative	0
502		13	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
503		13	Wall 4	Wall	Tile	White	Negative	0
504		14	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
505		14	Wall 1	Door Unit	Metal	Green	Negative	0
506		14	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
507		14	Wall 3	Window Unit	Metal	Green	Negative	0
508		14	Wall 3	Window Unit	Metal	Green	Negative	0
509		14	Wall 3	Support Post	Metal	Green	Negative	0
510		14	Wall 3	Unit Ventilator	Metal	White	Negative	0
511		14	Wall 3	Bar Joist	Metal	Black	Negative	0
512		14	Wall 4	Wall	Plaster-Gypsum	White	Negative	0

Confirmed Positive Component Types

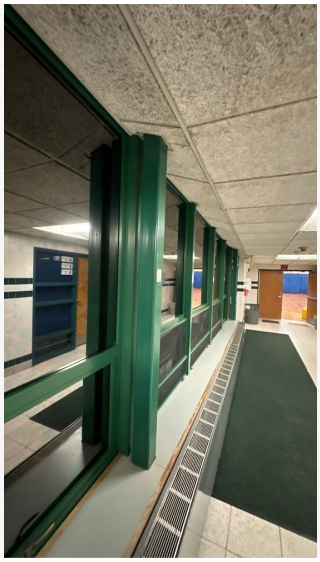
1



Allen rd
Rm2
Support Post

Project: B&L North Sryacuse SD
Date: 1/8/2024, 6:09pm
Creator: Daryl Heffron
Tags: Allen Road

2



Allen rd
Hall 6
Support post

Project: B&L North Sryacuse SD
Date: 1/8/2024, 6:24pm
Creator: Daryl Heffron
Tags: Allen Road

3



Allen rd
Hall 6
Ceiling ibeam

Project: B&L North Sryacuse SD
Date: 1/8/2024, 6:28pm
Creator: Daryl Heffron
Tags: Allen Road

Signature Page

The Individual listed below completed XRF testing at the Springbrook-Ford Block Apartments Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

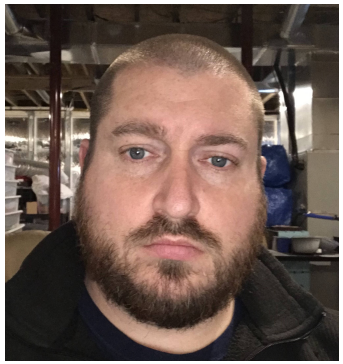
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

North Syracuse School District-Distric Office
5355 W Taft Road
North Syracuse, NY 13212

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/12/2024

1/12/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: North Syracuse School District-Distric Office
5355 W Taft Road
North Syracuse, NY 13212

Dear Ron:
On August 16, 2023, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 5355 West Taft Road, North Syracuse, NY 13212

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

Metal: Support Post

Plaster-Gypsum: Overhang (1)

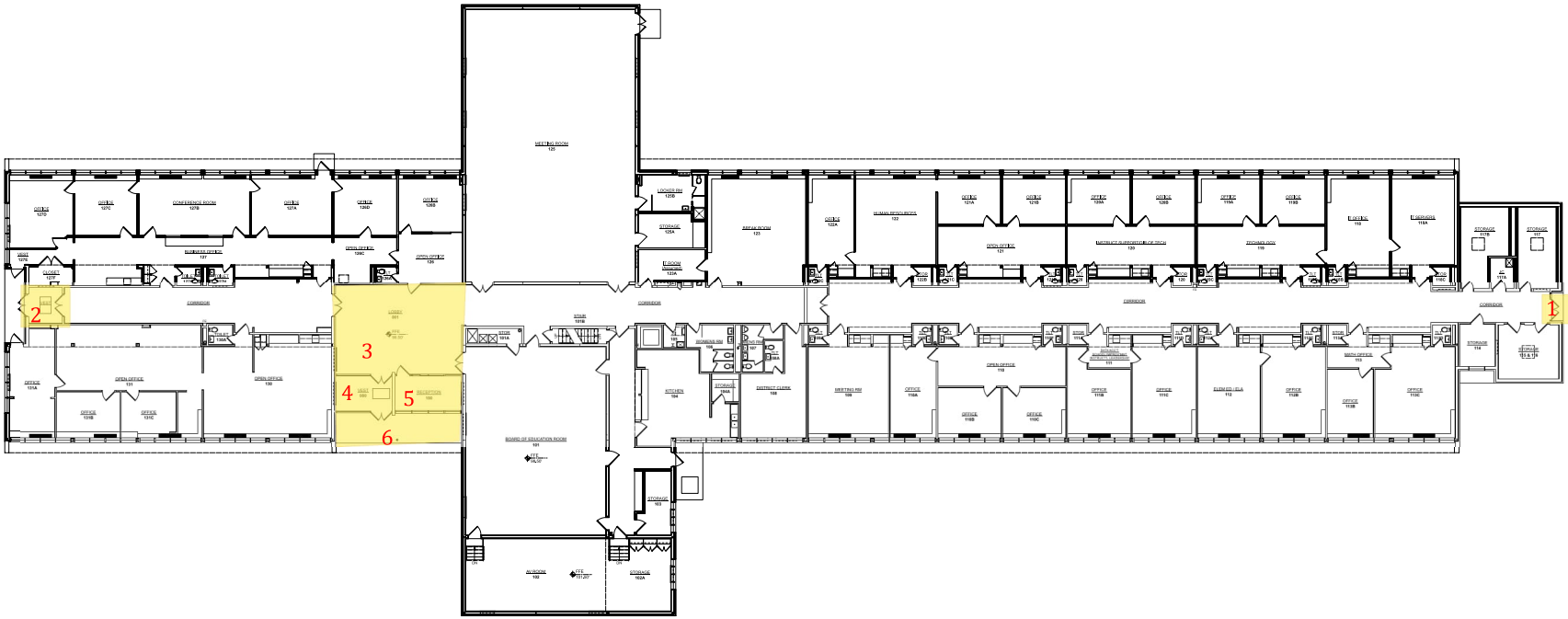
Wood: Door (1) Door Casing (3) Door Jamb/Stop (1) Window Sill (1) Window Unit (3)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



SK-1 DISTRICT OFFICE - FIRST FLOOR PLAN
Scale: 3/32" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/8/2024 18:50	Calibration	Pass	1.1
2	1/8/2024 18:50	Calibration	Pass	1.1
3	1/8/2024 18:51	Calibration	Pass	1.1
4	1/8/2024 18:53	Calibration	Pass	1.1
70	1/8/2024 18:55	Calibration	Pass	1.1
71	1/8/2024 18:55	Calibration	Pass	1
72	1/8/2024 18:55	Calibration	Pass	1
73	1/8/2024 18:57	Calibration	Pass	1
314	1/8/2024 18:58	Calibration	Pass	0.9
315	1/8/2024 18:58	Calibration	Pass	1
316	1/8/2024 18:58	Calibration	Pass	1
317	1/8/2024 18:58	Calibration	Pass	1
318	1/8/2024 18:58	Calibration	Pass	0.8
319	1/8/2024 18:59	Calibration	Pass	0.8
320	1/8/2024 18:59	Calibration	Pass	0.9
321	1/8/2024 18:59	Calibration	Pass	0.8
380	1/8/2024 19:00	Calibration	Pass	0.9
381	1/8/2024 19:00	Calibration	Pass	0.8
382	1/8/2024 19:00	Calibration	Pass	0.9
383	1/8/2024 19:01	Calibration	Pass	0.9
384	1/8/2024 19:01	Calibration	Pass	0.9
385	1/8/2024 19:01	Calibration	Pass	0.8
386	1/8/2024 19:02	Calibration	Pass	0.9
387	1/8/2024 19:02	Calibration	Pass	0.9
388	1/8/2024 19:02	Calibration	Pass	0.8
513	1/8/2024 19:05	Calibration	Pass	0.9
514	1/8/2024 19:05	Calibration	Pass	0.9
515	1/8/2024 19:05	Calibration	Pass	0.9
516	1/8/2024 19:05	Calibration	Pass	0.9

Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Bar Joist	2	100.00%	0	0.00%	2	100.00%
2	Ceiling	2	100.00%	0	0.00%	2	100.00%
3	Ceiling I-Beam	2	100.00%	0	0.00%	2	100.00%
4	Door	6	85.71%	1	14.29%	7	100.00%
5	Door Casing	5	62.50%	3	37.50%	8	100.00%
6	Door Jamb/Stop	0	0.00%	1	100.00%	1	100.00%
7	Door Unit	2	100.00%	0	0.00%	2	100.00%
8	Louvre	1	100.00%	0	0.00%	1	100.00%
9	Misc 1	1	100.00%	0	0.00%	1	100.00%
10	Overhang	2	66.67%	1	33.33%	3	100.00%
11	Support Post	0	0.00%	1	100.00%	1	100.00%
12	Unit Ventilator	5	100.00%	0	0.00%	5	100.00%
13	Wall	24	100.00%	0	0.00%	24	100.00%
14	Wall Molding	1	100.00%	0	0.00%	1	100.00%
15	Window Sill	0	0.00%	1	100.00%	1	100.00%
16	Window Unit	1	25.00%	3	75.00%	4	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
19		2	Wall 2	Door Casing	Wood	White	Positive	2.3
20		2	Wall 2	Door Jamb/Stop	Wood	Brown	Positive	3.9
21		2	Wall 2	Door	Wood	Brown	Positive	2.6
22		2	Wall 2	Overhang	Plaster-Gypsum	White	Positive	1
40		4	Wall 1	Window Unit	Wood	White	Positive	3.2
41		4	Wall 1	Window Sill	Wood	White	Positive	3.5
42		4	Wall 1	Door Casing	Wood	White	Positive	3.6
51		5	Wall 1	Window Unit	Wood	White	Positive	1.1
61		6	Wall 1	Support Post	Metal	White	Positive	2
62		6	Wall 3	Window Unit	Wood	Green	Positive	3
64		6	Wall 3	Door Casing	Wood	Green	Positive	4.2

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
5		1	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
6		1	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
7		1	Wall 3	Unit Ventilator	Metal	Brown	Negative	0
8		1	Wall 4	Door Unit	Metal	Brown	Negative	0
9		1	Wall 4	Door	Metal	Brown	Negative	0
10		1	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
11		1	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
12		1	Wall 4	Overhang	Plaster-Gypsum	White	Negative	0
13		1	Wall 1	Wall	Brick	Unpainted	Negative	0
14		1	Wall 4	Door Unit	Metal	Green	Negative	0
15		2	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.1
16		2	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
17		2	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
18		2	Wall 2	Door Casing	Wood	White	Negative	0
19		2	Wall 2	Door Casing	Wood	White	Positive	2.3
20		2	Wall 2	Door Jamb/Stop	Wood	Brown	Positive	3.9
21		2	Wall 2	Door	Wood	Brown	Positive	2.6
22		2	Wall 2	Overhang	Plaster-Gypsum	White	Positive	1
23		2	Wall 2	Wall	Brick	Brown	Negative	0
24		2	Wall 3	Unit Ventilator	Metal	Brown	Negative	0.1
25		2	Wall 3	Wall Molding	Wood	White	Negative	0
26		2	Wall 3	Louvre	Metal	White	Negative	0
27		2	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
28		2	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
29		2	Wall 4	Door Casing	Wood	Unpainted	Negative	0
30		2	Wall 4	Door	Wood	Unpainted	Negative	0
31		3	Wall 1	Door	Wood	Unpainted	Negative	0
32		3	Wall 1	Door Casing	Wood	Unpainted	Negative	0
33		3	Wall 1	Wall	Brick	Unpainted	Negative	0
34		3	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
35		3	Wall 2	Wall	Brick	Unpainted	Negative	0
36		3	Wall 2	Unit Ventilator	Metal	Brown	Negative	0.1
37		3	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
38		3	Wall 4	Wall	Brick	Unpainted	Negative	0
57		3	Wall 2	Ceiling I-Beam	Metal	Brown	Negative	0
58		3	Wall 2	Ceiling I-Beam	Metal	Brown	Negative	0
59		3	Wall 2	Bar Joist	Metal	Black	Negative	0
60		3	Wall 2	Bar Joist	Metal	Black	Negative	0
39		4	Wall 1	Wall	Brick	Unpainted	Negative	0
40		4	Wall 1	Window Unit	Wood	White	Positive	3.2
41		4	Wall 1	Window Sill	Wood	White	Positive	3.5
42		4	Wall 1	Door Casing	Wood	White	Positive	3.6
43		4	Wall 1	Door	Metal	Blue	Negative	0
44		4	Wall 2	Unit Ventilator	Metal	Brown	Negative	0
45		4	Wall 2	Wall	Brick	Unpainted	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
46		4	Wall 3	Wall	Brick	Unpainted	Negative	0
47		4	Wall 3	Window Unit	Wood	Unpainted	Negative	0
48		4	Wall 3	Door Casing	Wood	Unpainted	Negative	0
49		4	Wall 3	Door	Wood	Unpainted	Negative	0
50		4	Wall 4	Wall	Brick	Unpainted	Negative	0
51		5	Wall 1	Window Unit	Wood	White	Positive	1.1
52		5	Wall 4	Wall	Brick	Unpainted	Negative	0
53		5	Wall 4	Misc 1	Masonry	Brown	Negative	0
54		5	Wall 4	Unit Ventilator	Metal	Brown	Negative	0
55		5	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
56		5	Wall 2	Wall	Brick	Unpainted	Negative	0
61		6	Wall 1	Support Post	Metal	White	Positive	2
62		6	Wall 3	Window Unit	Wood	Green	Positive	3
63		6	Wall 3	Door Casing	Wood	Green	Negative	0
64		6	Wall 3	Door Casing	Wood	Green	Positive	4.2
65		6	Wall 3	Door	Metal	Green	Negative	0
66		6	Wall 2	Wall	Brick	Unpainted	Negative	0
67		6	Wall 3	Wall	Brick	Unpainted	Negative	0
68		6	Wall 4	Wall	Brick	Unpainted	Negative	0
69		6	Wall 4	Overhang	Metal	White	Negative	0

Confirmed Positive Component Types

1



Area 2 foyer
Entry way door casing, jamb and door

Project: B&L North Sryacuse SD
Date: 1/8/2024, 1:01pm
Creator: Daryl Heffron
Tags: District Office

2



Area 2 exterior overhang

Project: B&L North Sryacuse SD
Date: 1/8/2024, 1:05pm
Creator: Daryl Heffron
Tags: District Office

3



District offices
Area 4 entry
Window and door components

Project: B&L North Sryacuse SD
Date: 1/8/2024, 1:17pm
Creator: Daryl Heffron
Tags: District Office

4



District offices
Area 6
Support post, window and door components

Project: B&L North Sryacuse SD
Date: 1/8/2024, 1:34pm
Creator: Daryl Heffron
Tags: District Office

5



Support post
Area 6
District office

Project: B&L North Sryacuse SD
Date: 1/8/2024, 1:35pm
Creator: Daryl Heffron
Tags: District Office

Signature Page

The Individual listed below completed XRF testing at the North Syracuse School District-District Office Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

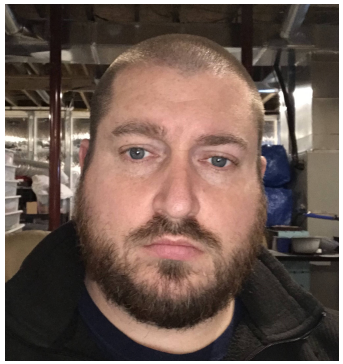
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

CNS High School
6002 NY-31
Cicero, NY 13039

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/15/2024

1/15/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: CNS High School
6002 NY-31
Cicero, NY 13039

Dear Ron:
On January 10, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 6002 NY-31, Cicero, NY 13039

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

Metal: Baluster (2) Stair Riser (3) Stair Stringer (5) Top Rail (3)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



SK-1 CNS HIGH SCHOOL - FIRST FLOOR PLAN
Scale: 1/16" = 1'-0"



SK-2 CNS HIGH SCHOOL - SECOND FLOOR PLAN
Scale: 1/16" = 1'-0"



SK-3 CNS HIGH SCHOOL - THIRD FLOOR PLAN
Scale: 1/16" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/10/2024 9:03	Calibration	Pass	0.9
2	1/10/2024 9:03	Calibration	Pass	1
3	1/10/2024 9:03	Calibration	Pass	0.9
4	1/10/2024 9:03	Calibration	Pass	0.9
112	1/10/2024 10:21	Calibration	Pass	1.1
113	1/10/2024 10:21	Calibration	Pass	1
114	1/10/2024 10:21	Calibration	Pass	1.1
115	1/10/2024 10:21	Calibration	Pass	1.1
116	1/10/2024 10:37	Calibration	Pass	0.9
117	1/10/2024 10:38	Calibration	Pass	0.9
118	1/10/2024 10:38	Calibration	Pass	0.9
119	1/10/2024 10:38	Calibration	Pass	0.9
145	1/10/2024 11:06	Calibration	Pass	0.8
146	1/10/2024 11:06	Calibration	Pass	0.9
147	1/10/2024 11:06	Calibration	Pass	0.9
148	1/10/2024 11:06	Calibration	Pass	0.9
149	1/10/2024 12:47	Calibration	Pass	0.9
150	1/10/2024 12:47	Calibration	Pass	0.9
151	1/10/2024 12:47	Calibration	Pass	1
152	1/10/2024 12:47	Calibration	Pass	0.9
206	1/10/2024 13:27	Calibration	Fail	0.8
207	1/10/2024 13:27	Calibration	Pass	1
208	1/10/2024 13:28	Calibration	Pass	1
209	1/10/2024 13:28	Calibration	Pass	0.9
210	1/10/2024 14:13	Calibration	Pass	0.9
211	1/10/2024 14:13	Calibration	Pass	1
212	1/10/2024 14:13	Calibration	Pass	0.9
213	1/10/2024 14:13	Calibration	Pass	0.9
332	1/10/2024 15:22	Calibration	Pass	1
333	1/10/2024 15:22	Calibration	Pass	1
334	1/10/2024 15:22	Calibration	Pass	1
335	1/10/2024 15:22	Calibration	Pass	1
336	1/10/2024 17:06	Calibration	Pass	1
337	1/10/2024 17:06	Calibration	Pass	1
338	1/10/2024 17:06	Calibration	Pass	1
339	1/10/2024 17:06	Calibration	Pass	1
607	1/10/2024 20:13	Calibration	Pass	0.9
608	1/10/2024 20:13	Calibration	Pass	0.9
609	1/10/2024 20:13	Calibration	Pass	1
610	1/10/2024 20:14	Calibration	Pass	0.9
612	1/10/2024 20:53	Calibration	Pass	0.9
613	1/10/2024 20:53	Calibration	Pass	0.9
614	1/10/2024 20:53	Calibration	Pass	1
615	1/10/2024 20:53	Calibration	Pass	0.9
728	1/10/2024 22:06	Calibration	Fail	0.7

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
729	1/10/2024 22:06	Calibration	Pass	1
730	1/10/2024 22:06	Calibration	Pass	1
731	1/10/2024 22:06	Calibration	Pass	0.9

Summary

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: CNS High School
6002 NY-31, Cicero, NY 13039

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Baluster	7	77.78%	2	22.22%	9	100.00%
2	Bar Joist	3	100.00%	0	0.00%	3	100.00%
3	Baseboard	1	100.00%	0	0.00%	1	100.00%
4	Ceiling	2	100.00%	0	0.00%	2	100.00%
5	Ceiling I-Beam	1	100.00%	0	0.00%	1	100.00%
6	Door	4	100.00%	0	0.00%	4	100.00%
7	Door Casing	1	100.00%	0	0.00%	1	100.00%
8	Door Unit	10	100.00%	0	0.00%	10	100.00%
9	Hand Rail	6	100.00%	0	0.00%	6	100.00%
10	Stair Riser	4	57.14%	3	42.86%	7	100.00%
11	Stair Stringer	5	50.00%	5	50.00%	10	100.00%
12	Stair Tread	5	100.00%	0	0.00%	5	100.00%
13	Top Rail	7	70.00%	3	30.00%	10	100.00%
14	Wall	39	100.00%	0	0.00%	39	100.00%
15	Window Unit	4	100.00%	0	0.00%	4	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
659		4	Wall 1	Stair Stringer	Metal	White	Positive	1.6
660		4	Wall 1	Stair Riser	Metal	Gray	Positive	3.4
663		4	Wall 3	Top Rail	Metal	White	Positive	2.5
669		5	Wall 4	Baluster	Metal	White	Positive	1.9
670		5	Wall 4	Stair Stringer	Metal	White	Positive	2.7
671		5	Wall 4	Stair Riser	Metal	Gray	Positive	3.3
672		5	Wall 4	Top Rail	Metal	Gray	Positive	1.6
683		6	Wall 4	Stair Stringer	Metal	White	Positive	4.8
684		6	Wall 4	Stair Stringer	Metal	Gray	Positive	3.3
723		9	Wall 2	Top Rail	Metal	White	Positive	2.7
724		9	Wall 2	Baluster	Metal	White	Positive	2.1
725		9	Wall 2	Stair Stringer	Metal	White	Positive	1.3
726		9	Wall 2	Stair Riser	Metal	Gray	Positive	1.4

XRF Results

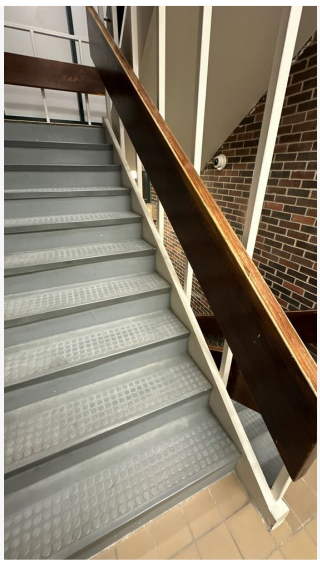
XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
616		1	Wall 1	Wall	Masonry	White	Negative	0
617		1	Wall 2	Wall	Masonry	White	Negative	0
618		1	Wall 2	Door Unit	Metal	White	Negative	0
619		1	Wall 2	Hand Rail	Metal	White	Negative	0
620		1	Wall 2	Top Rail	Metal	White	Negative	0
621		1	Wall 2	Stair Stringer	Metal	White	Negative	0
622		1	Wall 2	Stair Riser	Metal	White	Negative	0
623		1	Wall 2	Stair Tread	Masonry	Gray	Negative	0
624		1	Wall 2	Stair Tread	Masonry	Gray	Negative	0
625		1	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
626		1	Wall 3	Wall	Masonry	White	Negative	0
627		1	Wall 4	Wall	Masonry	White	Negative	0
628		1	Wall 4	Hand Rail	Metal	Yellow	Negative	0
629		2	Wall 1	Wall	Masonry	White	Negative	0
630		2	Wall 2	Wall	Masonry	White	Negative	0
631		2	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
632		2	Wall 2	Hand Rail	Metal	White	Negative	0
633		2	Wall 2	Hand Rail	Metal	Yellow	Negative	0
634		2	Wall 2	Top Rail	Metal	White	Negative	0
635		2	Wall 2	Baluster	Metal	White	Negative	0
636		2	Wall 2	Stair Stringer	Metal	White	Negative	0
637		2	Wall 2	Stair Riser	Metal	White	Negative	0
638		2	Wall 2	Stair Tread	Masonry	Gray	Negative	0
639		2	Wall 3	Wall	Masonry	White	Negative	0
640		2	Wall 4	Wall	Masonry	White	Negative	0
641		2	Wall 4	Door Unit	Metal	White	Negative	0
642		3	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
643		3	Wall 1	Wall	Tile	White	Negative	0
644		3	Wall 1	Baseboard	Metal	White	Negative	0
645		3	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
646		3	Wall 2	Wall	Tile	White	Negative	0
647		3	Wall 3	Stair Stringer	Metal	White	Negative	0
648		3	Wall 3	Baluster	Metal	White	Negative	0
649		3	Wall 3	Top Rail	Metal	White	Negative	0
650		3	Wall 4	Wall	Tile	White	Negative	0
651		3	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
652		3	Wall 4	Bar Joist	Metal	Brown	Negative	0
653		3	Wall 4	Ceiling I-Beam	Metal	Brown	Negative	0
654		4	Wall 1	Door Unit	Metal	White	Negative	0
655		4	Wall 1	Door Unit	Metal	White	Negative	0
656		4	Wall 1	Door Unit	Metal	White	Negative	0.2
657		4	Wall 1	Door	Wood	Green	Negative	0.2
658		4	Wall 1	Baluster	Metal	White	Negative	0.3
659		4	Wall 1	Stair Stringer	Metal	White	Positive	1.6
660		4	Wall 1	Stair Riser	Metal	Gray	Positive	3.4

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
661		4	Wall 2	Wall	Brick	Unpainted	Negative	0
662		4	Wall 3	Window Unit	Metal	Green	Negative	0
663		4	Wall 3	Top Rail	Metal	White	Positive	2.5
664		5	Wall 1	Wall	Brick	Unpainted	Negative	0
665		5	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
666		5	Wall 4	Door Unit	Metal	Green	Negative	0
667		5	Wall 4	Door	Metal	Green	Negative	0
668		5	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0.1
669		5	Wall 4	Baluster	Metal	White	Positive	1.9
670		5	Wall 4	Stair Stringer	Metal	White	Positive	2.7
671		5	Wall 4	Stair Riser	Metal	Gray	Positive	3.3
672		5	Wall 4	Top Rail	Metal	Gray	Positive	1.6
673		5	Wall 3	Wall	Brick	Unpainted	Negative	0
674		6	Wall 1	Wall	Brick	Unpainted	Negative	0
675		6	Wall 1	Door Unit	Metal	White	Negative	0
676		6	Wall 1	Door	Metal	Green	Negative	0
677		6	Wall 2	Wall	Tile	White	Negative	0
678		6	Wall 3	Wall	Brick	Unpainted	Negative	0
679		6	Wall 4	Door Unit	Metal	Gray	Negative	0
680		6	Wall 4	Baluster	Metal	White	Negative	0.3
681		6	Wall 4	Baluster	Metal	White	Negative	0
682		6	Wall 4	Top Rail	Metal	White	Negative	0.1
683		6	Wall 4	Stair Stringer	Metal	White	Positive	4.8
684		6	Wall 4	Stair Stringer	Metal	Gray	Positive	3.3
685		6	Wall 4	Top Rail	Metal	White	Negative	0
686		6	Wall 4	Window Unit	Metal	White	Negative	0
687		6	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
688		6	Wall 4	Wall	Tile	White	Negative	0
689		7	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
690		7	Wall 1	Door Unit	Metal	White	Negative	0
691		7	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
692		7	Wall 2	Wall	Masonry	White	Negative	0
693		7	Wall 2	Stair Stringer	Metal	White	Negative	0
694		7	Wall 2	Stair Riser	Metal	White	Negative	0
695		7	Wall 2	Stair Tread	Masonry	Gray	Negative	0
696		7	Wall 2	Baluster	Metal	White	Negative	0
697		7	Wall 2	Top Rail	Metal	White	Negative	0
698		7	Wall 2	Hand Rail	Metal	Yellow	Negative	0
699		7	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
700		7	Wall 4	Wall	Masonry	White	Negative	0
701		7	Wall 4	Bar Joist	Metal	Gray	Negative	0
702		8	Wall 4	Bar Joist	Metal	Gray	Negative	0
703		8	Wall 1	Door Unit	Metal	White	Negative	0
704		8	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
705		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
706		8	Wall 2	Wall	Masonry	White	Negative	0
707		8	Wall 2	Hand Rail	Metal	Yellow	Negative	0
708		8	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
709		8	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
710		8	Wall 4	Wall	Masonry	White	Negative	0
711		8	Wall 4	Stair Stringer	Metal	White	Negative	0
712		8	Wall 4	Stair Riser	Metal	White	Negative	0
713		8	Wall 4	Stair Tread	Masonry	Gray	Negative	0
714		8	Wall 4	Baluster	Metal	White	Negative	0
715		8	Wall 4	Top Rail	Metal	White	Negative	0
716		9	Wall 1	Wall	Brick	Unpainted	Negative	0
717		9	Wall 1	Door Casing	Metal	White	Negative	0
718		9	Wall 1	Door	Metal	Blue	Negative	0.2
719		9	Wall 4	Wall	Tile	White	Negative	0
720		9	Wall 2	Wall	Tile	White	Negative	0
721		9	Wall 2	Window Unit	Metal	Green	Negative	0
722		9	Wall 2	Window Unit	Metal	Green	Negative	0
723		9	Wall 2	Top Rail	Metal	White	Positive	2.7
724		9	Wall 2	Baluster	Metal	White	Positive	2.1
725		9	Wall 2	Stair Stringer	Metal	White	Positive	1.3
726		9	Wall 2	Stair Riser	Metal	Gray	Positive	1.4
727		9	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0

Confirmed Positive Component Types

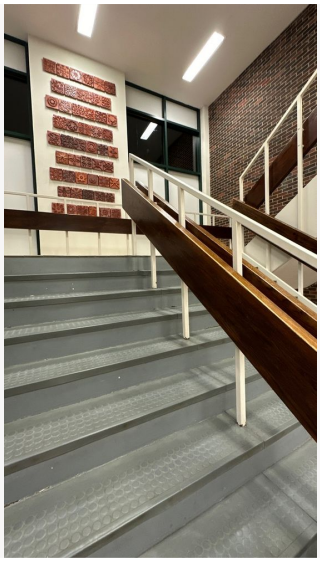
1



Cns stair 4
Stair stringer, riser and top rail

Project: B&L North Sryacuse SD
Date: 1/10/2024, 9:23pm
Creator: Daryl Heffron
Tags: CNS High

2



Cns high
Stair 5
Stair components

Project: B&L North Sryacuse SD
Date: 1/10/2024, 9:30pm
Creator: Daryl Heffron
Tags: CNS High

3



Cns high
Stair 6
Stair riser and stringer

Project: B&L North Sryacuse SD
Date: 1/10/2024, 9:37pm
Creator: Daryl Heffron
Tags: CNS High

Signature Page

The Individual listed below completed XRF testing at the Springbrook-Ford Block Apartments Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

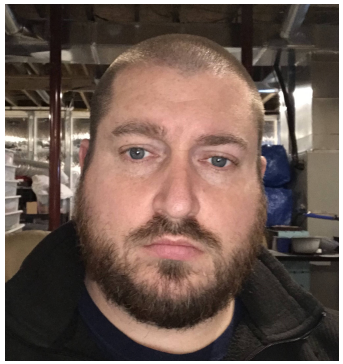
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

CNS Junior High School
5353 North Taft Road
N Syracuse, NY 13212

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/15/2024

1/15/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: CNS Junior High School
5353 N Taft Road
N Syracuse, NY 13212

Dear Ron:
On January 8, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 5353 N Taft Rd, N Syracuse, NY 13212

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

Metal: Ceiling I-Beam (6) Support Post (1)

If you have any questions regarding this report, please feel free to give us a call at any time.

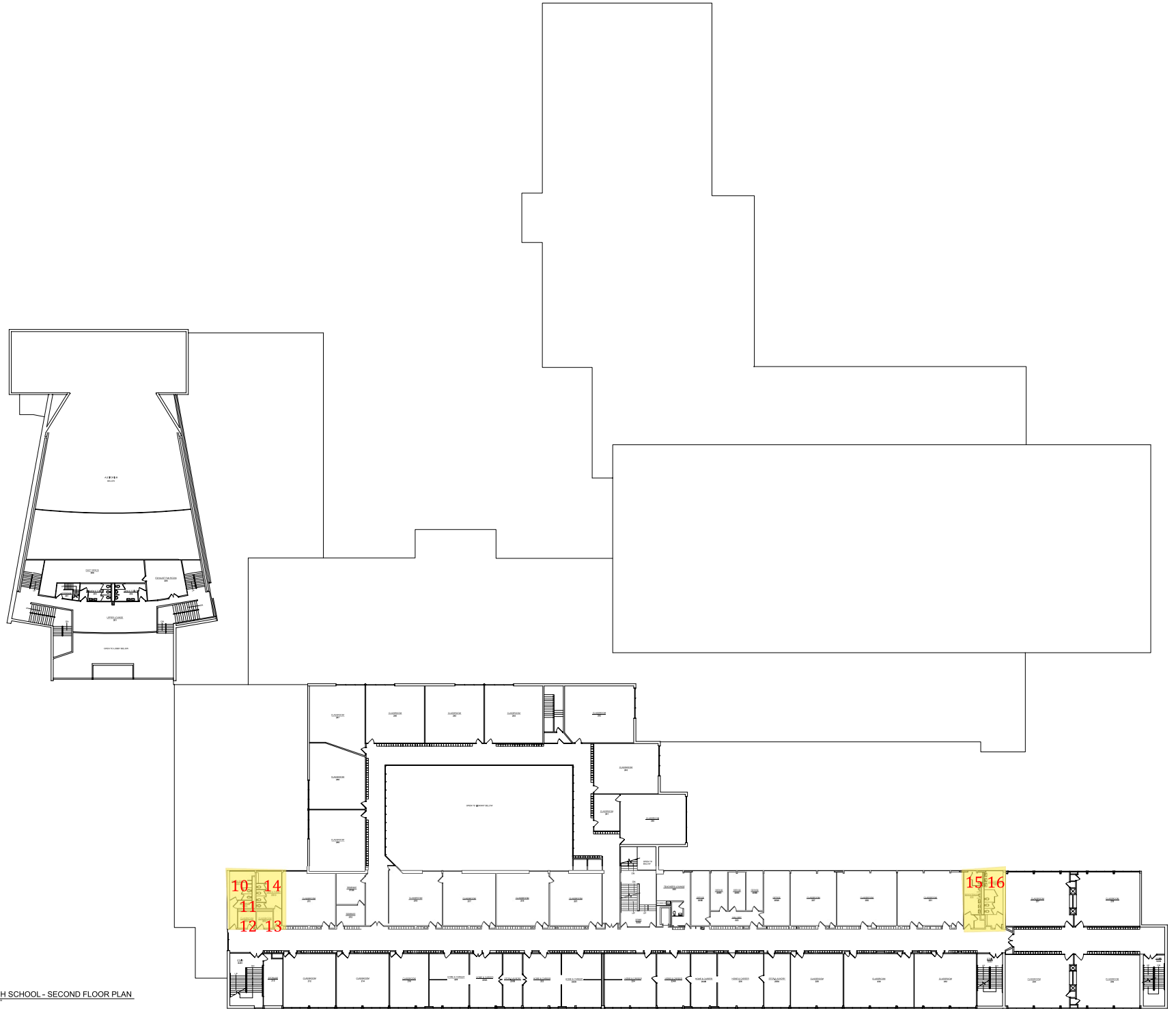
Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



SK-1 JUNIOR HIGH SCHOOL - FIRST FLOOR PLAN
Scale: 1/16" = 1'-0"



SK-2 JUNIOR HIGH SCHOOL - SECOND FLOOR PLAN
Scale: 1/16" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/8/2024 18:50	Calibration	Pass	1.1
2	1/8/2024 18:50	Calibration	Pass	1.1
3	1/8/2024 18:51	Calibration	Pass	1.1
4	1/8/2024 18:53	Calibration	Pass	1.1
70	1/8/2024 18:55	Calibration	Pass	1.1
71	1/8/2024 18:55	Calibration	Pass	1
72	1/8/2024 18:55	Calibration	Pass	1
73	1/8/2024 18:57	Calibration	Pass	1
314	1/8/2024 18:58	Calibration	Pass	0.9
315	1/8/2024 18:58	Calibration	Pass	1
316	1/8/2024 18:58	Calibration	Pass	1
317	1/8/2024 18:58	Calibration	Pass	1
318	1/8/2024 18:58	Calibration	Pass	0.8
319	1/8/2024 18:59	Calibration	Pass	0.8
320	1/8/2024 18:59	Calibration	Pass	0.9
321	1/8/2024 18:59	Calibration	Pass	0.8
380	1/8/2024 19:00	Calibration	Pass	0.9
381	1/8/2024 19:00	Calibration	Pass	0.8
382	1/8/2024 19:00	Calibration	Pass	0.9
383	1/8/2024 19:01	Calibration	Pass	0.9
384	1/8/2024 19:01	Calibration	Pass	0.9
385	1/8/2024 19:01	Calibration	Pass	0.8
386	1/8/2024 19:02	Calibration	Pass	0.9
387	1/8/2024 19:02	Calibration	Pass	0.9
388	1/8/2024 19:02	Calibration	Pass	0.8
513	1/8/2024 19:05	Calibration	Pass	0.9
514	1/8/2024 19:05	Calibration	Pass	0.9
515	1/8/2024 19:05	Calibration	Pass	0.9
516	1/8/2024 19:05	Calibration	Pass	0.9

Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Bar Joist	11	100.00%	0	0.00%	11	100.00%
2	Ceiling	6	100.00%	0	0.00%	6	100.00%
3	Ceiling I-Beam	4	40.00%	6	60.00%	10	100.00%
4	Door	14	100.00%	0	0.00%	14	100.00%
5	Door Casing	1	100.00%	0	0.00%	1	100.00%
6	Door Unit	28	100.00%	0	0.00%	28	100.00%
7	Fire Ext. Case	1	100.00%	0	0.00%	1	100.00%
8	Floor	3	100.00%	0	0.00%	3	100.00%
9	Hand Rail	1	100.00%	0	0.00%	1	100.00%
10	Heating Grate	1	100.00%	0	0.00%	1	100.00%
11	Locker	6	100.00%	0	0.00%	6	100.00%
12	Radiator	6	100.00%	0	0.00%	6	100.00%
13	Shelving	1	100.00%	0	0.00%	1	100.00%
14	Stall	2	100.00%	0	0.00%	2	100.00%
15	Support Post	2	66.67%	1	33.33%	3	100.00%
16	Unit Ventilator	6	100.00%	0	0.00%	6	100.00%
17	Wall	132	100.00%	0	0.00%	132	100.00%
18	Window Unit	8	100.00%	0	0.00%	8	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
101		2	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1.1
122		4	Wall 2	Support Post	Metal	Green	Positive	1.5
148		7	Wall 1	Ceiling I-Beam	Metal	Black	Positive	1.3
182		8	Wall 1	Ceiling I-Beam	Metal	Black	Positive	1.3
217		12	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1
252		15	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1.2
278		17	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
74		1	Wall 1	Door Unit	Metal	Green	Negative	0.1
75		1	Wall 1	Door	Metal	Green	Negative	0
76		1	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
77		1	Wall 1	Wall	Tile	White	Negative	0
78		1	Wall 1	Wall	Tile	Green	Negative	0
79		1	Wall 2	Wall	Tile	White	Negative	0
80		1	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
81		1	Wall 2	Unit Ventilator	Metal	Brown	Negative	0
82		1	Wall 3	Door Unit	Metal	Green	Negative	0
83		1	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
84		1	Wall 3	Wall	Tile	White	Negative	0
85		1	Wall 4	Wall	Tile	White	Negative	0
86		1	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
87		2	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
88		2	Wall 1	Wall	Tile	White	Negative	0
89		2	Wall 1	Door Unit	Metal	Green	Negative	0
90		2	Wall 2	Wall	Tile	White	Negative	0
91		2	Wall 2	Wall	Tile	Green	Negative	0
92		2	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
93		2	Wall 2	Unit Ventilator	Metal	Brown	Negative	0
94		2	Wall 3	Door Unit	Metal	Green	Negative	0.1
95		2	Wall 3	Door	Metal	Green	Negative	0
96		2	Wall 3	Wall	Tile	White	Negative	0
97		2	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
98		2	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
99		2	Wall 4	Wall	Tile	White	Negative	0
100		2	Wall 4	Ceiling I-Beam	Metal	Black	Negative	0.8
101		2	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1.1
102		2	Wall 4	Bar Joist	Metal	Black	Negative	0
103		2	Wall 4	Bar Joist	Metal	Black	Negative	0
104		3	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
105		3	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
106		3	Wall 2	Door Unit	Metal	Green	Negative	0
107		3	Wall 2	Floor	Masonry	Gray	Negative	0
108		3	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
109		3	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
110		4	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
111		4	Wall 1	Wall	Tile	White	Negative	0
112		4	Wall 1	Door Unit	Metal	Green	Negative	0
113		4	Wall 1	Door	Metal	Green	Negative	0
114		4	Wall 2	Locker	Metal	Blue	Negative	0
115		4	Wall 2	Locker	Metal	Blue	Negative	0
116		4	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
117		4	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
118		4	Wall 4	Locker	Metal	Blue	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
119		4	Wall 4	Locker	Metal	Blue	Negative	0
120		4	Wall 2	Radiator	Metal	Green	Negative	0.1
121		4	Wall 2	Support Post	Metal	Green	Negative	0.7
122		4	Wall 2	Support Post	Metal	Green	Positive	1.5
123		4	Wall 2	Window Unit	Metal	Green	Negative	0
124		4	Wall 2	Wall	Masonry	White	Negative	0
125		4	Wall 2	Door Unit	Metal	Green	Negative	0.1
126		4	Wall 2	Door	Metal	Green	Negative	0
127		4	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
128		4	Wall 3	Wall	Tile	White	Negative	0
129		4	Wall 4	Wall	Masonry	White	Negative	0.9
130		4	Wall 4	Wall	Masonry	White	Negative	0.6
131		4	Wall 4	Bar Joist	Metal	Black	Negative	0
132		4	Wall 4	Bar Joist	Metal	Black	Negative	0
133		5	Wall 1	Wall	Brick	Unpainted	Negative	0
134		5	Wall 2	Door Unit	Metal	Green	Negative	0
135		5	Wall 2	Door	Metal	Green	Negative	0
136		5	Wall 3	Wall	Brick	Unpainted	Negative	0
137		5	Wall 4	Door	Metal	Green	Negative	0
138		6	Wall 1	Door Unit	Metal	Green	Negative	0.1
139		6	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
140		6	Wall 1	Wall	Tile	White	Negative	0
141		6	Wall 2	Wall	Tile	White	Negative	0
142		6	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
143		6	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
144		6	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
145		6	Wall 4	Wall	Tile	White	Negative	0
146		6	Wall 4	Bar Joist	Metal	Black	Negative	0.1
147		7	Wall 1	Bar Joist	Metal	Black	Negative	0
148		7	Wall 1	Ceiling I-Beam	Metal	Black	Positive	1.3
149		7	Wall 1	Door Unit	Metal	Green	Negative	0
150		7	Wall 1	Door	Metal	Green	Negative	0
151		7	Wall 1	Wall	Tile	White	Negative	0
152		7	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
153		7	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
154		7	Wall 2	Wall	Tile	White	Negative	0
155		7	Wall 3	Wall	Tile	White	Negative	0
156		7	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
157		7	Wall 3	Heating Grate	Metal	White	Negative	0.2
158		7	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
159		7	Wall 4	Wall	Tile	White	Negative	0
160		8	Wall 1	Door Unit	Metal	Green	Negative	0
161		8	Wall 1	Door	Metal	Green	Negative	0
162		8	Wall 2	Fire Ext. Case	Metal	Red	Negative	0.1
163		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
164		8	Wall 2	Wall	Tile	White	Negative	0
165		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
166		8	Wall 2	Door Unit	Metal	Green	Negative	0.1
167		8	Wall 2	Unit Ventilator	Metal	Brown	Negative	0
168		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.7
169		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.5
170		8	Wall 2	Wall	Tile	White	Negative	0
171		8	Wall 2	Locker	Metal	Green	Negative	0
172		8	Wall 2	Locker	Metal	Green	Negative	0
173		8	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
174		8	Wall 3	Wall	Tile	White	Negative	0
175		8	Wall 3	Door Casing	Wood	Green	Negative	0
176		8	Wall 3	Unit Ventilator	Metal	Brown	Negative	0
177		8	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
178		8	Wall 4	Door Unit	Metal	Green	Negative	0
179		8	Wall 4	Door	Metal	Green	Negative	0
180		8	Wall 1	Wall	Brick	White	Negative	0
181		8	Wall 1	Bar Joist	Metal	Black	Negative	0
182		8	Wall 1	Ceiling I-Beam	Metal	Black	Positive	1.3
183		8	Wall 1	Ceiling I-Beam	Metal	Brown	Negative	0
184		9	Wall 1	Window Unit	Metal	Green	Negative	0
185		9	Wall 1	Window Unit	Metal	Green	Negative	0
186		9	Wall 1	Door Unit	Metal	Green	Negative	0
187		9	Wall 1	Door	Metal	Green	Negative	0
188		9	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
189		10	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
190		10	Wall 1	Door Unit	Metal	Pink	Negative	0
191		10	Wall 2	Wall	Tile	Green	Negative	0
192		10	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
193		10	Wall 3	Wall	Tile	White	Negative	0
194		10	Wall 3	Radiator	Metal	Brown	Negative	0
195		10	Wall 3	Window Unit	Metal	Green	Negative	0
196		10	Wall 4	Wall	Tile	Green	Negative	0
197		10	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
198		11	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.2
199		11	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
200		11	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
201		11	Wall 2	Floor	Masonry	Gray	Negative	0.1
202		11	Wall 2	Door Unit	Metal	Gray	Negative	0.2
203		11	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
204		11	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
205		12	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
206		12	Wall 1	Wall	Tile	White	Negative	0
207		12	Wall 1	Wall	Tile	Brown	Negative	0
208		12	Wall 1	Door Unit	Metal	Pink	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
209		12	Wall 1	Door Unit	Metal	Pink	Negative	0
210		12	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
211		12	Wall 2	Wall	Tile	White	Negative	0
212		12	Wall 3	Wall	Tile	White	Negative	0
213		12	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
214		12	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
215		12	Wall 4	Wall	Tile	White	Negative	0
216		12	Wall 4	Bar Joist	Metal	Black	Negative	0
217		12	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1
218		13	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
219		13	Wall 1	Wall	Tile	White	Negative	0
220		13	Wall 1	Door Unit	Metal	Pink	Negative	0
221		13	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
222		13	Wall 2	Wall	Tile	White	Negative	0
223		13	Wall 3	Wall	Tile	White	Negative	0
224		13	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
225		13	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
226		13	Wall 4	Wall	Tile	White	Negative	0
227		14	Wall 1	Wall	Tile	Yellow	Negative	0
228		14	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
229		14	Wall 1	Stall	Metal	Green	Negative	0.1
230		14	Wall 1	Door Unit	Metal	Green	Negative	0
231		14	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
232		14	Wall 2	Wall	Tile	Yellow	Negative	0
233		14	Wall 2	Stall	Metal	Green	Negative	0.1
234		14	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
235		14	Wall 3	Wall	Tile	White	Negative	0
236		14	Wall 3	Radiator	Metal	Brown	Negative	0
237		14	Wall 3	Window Unit	Metal	Green	Negative	0
238		14	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
239		14	Wall 4	Wall	Tile	Yellow	Negative	0
240		15	Wall 1	Wall	Tile	White	Negative	0
241		15	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
242		15	Wall 1	Door Unit	Metal	Green	Negative	0
243		15	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
244		15	Wall 2	Wall	Tile	Brown	Negative	0
245		15	Wall 3	Wall	Tile	White	Negative	0
246		15	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
247		15	Wall 3	Radiator	Metal	Brown	Negative	0
248		15	Wall 3	Window Unit	Metal	Green	Negative	0
249		15	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
250		15	Wall 4	Wall	Tile	White	Negative	0
251		15	Wall 4	Bar Joist	Metal	Black	Negative	0
252		15	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1.2
253		16	Wall 1	Door Unit	Metal	Green	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
254		16	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
255		16	Wall 1	Wall	Tile	White	Negative	0
256		16	Wall 2	Wall	Tile	White	Negative	0
257		16	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
258		16	Wall 3	Wall	Tile	White	Negative	0
259		16	Wall 3	Radiator	Metal	Brown	Negative	0
260		16	Wall 3	Window Unit	Metal	Green	Negative	0
261		16	Wall 4	Wall	Tile	Green	Negative	0
262		16	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
263		16	Wall 4	Unit Ventilator	Plaster-Gypsum	Brown	Negative	0
264		17	Wall 1	Wall	Brick	Unpainted	Negative	0
265		17	Wall 1	Wall	Tile	White	Negative	0
266		17	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
267		17	Wall 1	Window Unit	Metal	Green	Negative	0
268		17	Wall 2	Door Unit	Metal	Green	Negative	0
269		17	Wall 2	Door Unit	Metal	Green	Negative	0
270		17	Wall 2	Door	Metal	Green	Negative	0
271		17	Wall 2	Door	Metal	Green	Negative	0
272		17	Wall 3	Wall	Brick	Unpainted	Negative	0
273		17	Wall 3	Unit Ventilator	Metal	Brown	Negative	0
274		17	Wall 4	Wall	Brick	Unpainted	Negative	0
275		17	Wall 4	Bar Joist	Metal	Black	Negative	0
276		17	Wall 4	Ceiling I-Beam	Metal	Black	Negative	0.7
277		17	Wall 4	Ceiling I-Beam	Metal	Black	Negative	0.9
278		17	Wall 4	Ceiling I-Beam	Metal	Black	Positive	1
279		17	Wall 1	Door Unit	Metal	Green	Negative	0.2
280		17	Wall 1	Wall	Tile	White	Negative	0
281		17	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
282		17	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
283		17	Wall 2	Wall	Tile	White	Negative	0
284		17	Wall 3	Wall	Tile	White	Negative	0
285		17	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
286		17	Wall 3	Bar Joist	Metal	Brown	Negative	0
287		17	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
288		17	Wall 4	Wall	Tile	White	Negative	0
289		19	Wall 1	Wall	Tile	White	Negative	0
290		19	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
291		19	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
292		19	Wall 2	Wall	Tile	White	Negative	0
293		19	Wall 2	Door Unit	Metal	Green	Negative	0.1
294		19	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
295		19	Wall 3	Wall	Tile	White	Negative	0
296		19	Wall 4	Wall	Tile	White	Negative	0
297		19	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
298		19	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
299		19	Wall 3	Radiator	Metal	Brown	Negative	0
300		20	Wall 1	Floor	Masonry	Gray	Negative	0
301		20	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
302		20	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
303		20	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
304		20	Wall 2	Door Unit	Metal	Green	Negative	0.1
305		20	Wall 2	Door	Wood	Green	Negative	0.1
306		20	Wall 3	Shelving	Wood	White	Negative	0
307		20	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
308		20	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
309		21	Wall 1	Hand Rail	Metal	Green	Negative	0.1
310		21	Wall 1	Support Post	Metal	Green	Negative	0.6
311		21	Wall 3	Wall	Brick	Unpainted	Negative	0
312		21	Wall 4	Door Unit	Metal	Green	Negative	0
313		21	Wall 4	Door	Metal	Green	Negative	0

Confirmed Positive Component Types

1



Jh room 2
Ceiling I-beam

Project: B&L North Sryacuse SD
Date: 1/8/2024, 2:33pm
Creator: Daryl Heffron
Tags: Junior High

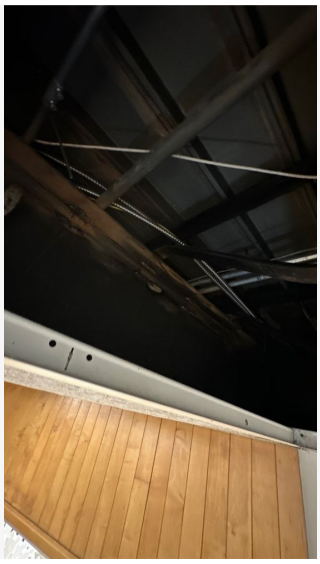
2



Jh room 4
Support post by windows

Project: B&L North Sryacuse SD
Date: 1/8/2024, 2:43pm
Creator: Daryl Heffron
Tags: Junior High

3



Jh room 8
Ceiling ibeam

Project: B&L North Sryacuse SD
Date: 1/8/2024, 3:11pm
Creator: Daryl Heffron
Tags: Junior High

Signature Page

The Individual listed below completed XRF testing at the CNS Junior High School Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

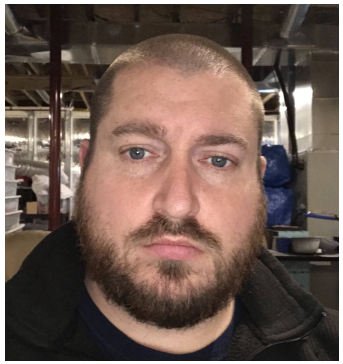
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

CNS-Roxboro Elementary School
200 Bernard Street
Syracuse, NY 13211

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/15/2024

1/15/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: CNS-Roxboro Elementary School
200 Bernard Street
Syracuse, NY 13211

Dear Ron:
On January 10, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 200 Bernard Street, Syracuse, NY 13211

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

Metal: Ceiling I-Beam (2) Support Post (1)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



SK-1 ROXBORO ELEMENTARY SCHOOL - FIRST FLOOR PLAN
Scale: 3/32" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/10/2024 9:03	Calibration	Pass	0.9
2	1/10/2024 9:03	Calibration	Pass	1
3	1/10/2024 9:03	Calibration	Pass	0.9
4	1/10/2024 9:03	Calibration	Pass	0.9
112	1/10/2024 10:21	Calibration	Pass	1.1
113	1/10/2024 10:21	Calibration	Pass	1
114	1/10/2024 10:21	Calibration	Pass	1.1
115	1/10/2024 10:21	Calibration	Pass	1.1
116	1/10/2024 10:37	Calibration	Pass	0.9
117	1/10/2024 10:38	Calibration	Pass	0.9
118	1/10/2024 10:38	Calibration	Pass	0.9
119	1/10/2024 10:38	Calibration	Pass	0.9
145	1/10/2024 11:06	Calibration	Pass	0.8
146	1/10/2024 11:06	Calibration	Pass	0.9
147	1/10/2024 11:06	Calibration	Pass	0.9
148	1/10/2024 11:06	Calibration	Pass	0.9
149	1/10/2024 12:47	Calibration	Pass	0.9
150	1/10/2024 12:47	Calibration	Pass	0.9
151	1/10/2024 12:47	Calibration	Pass	1
152	1/10/2024 12:47	Calibration	Pass	0.9
206	1/10/2024 13:27	Calibration	Fail	0.8
207	1/10/2024 13:27	Calibration	Pass	1
208	1/10/2024 13:28	Calibration	Pass	1
209	1/10/2024 13:28	Calibration	Pass	0.9
210	1/10/2024 14:13	Calibration	Pass	0.9
211	1/10/2024 14:13	Calibration	Pass	1
212	1/10/2024 14:13	Calibration	Pass	0.9
213	1/10/2024 14:13	Calibration	Pass	0.9
332	1/10/2024 15:22	Calibration	Pass	1
333	1/10/2024 15:22	Calibration	Pass	1
334	1/10/2024 15:22	Calibration	Pass	1
335	1/10/2024 15:22	Calibration	Pass	1
336	1/10/2024 17:06	Calibration	Pass	1
337	1/10/2024 17:06	Calibration	Pass	1
338	1/10/2024 17:06	Calibration	Pass	1
339	1/10/2024 17:06	Calibration	Pass	1
607	1/10/2024 20:13	Calibration	Pass	0.9
608	1/10/2024 20:13	Calibration	Pass	0.9
609	1/10/2024 20:13	Calibration	Pass	1
610	1/10/2024 20:14	Calibration	Pass	0.9
612	1/10/2024 20:53	Calibration	Pass	0.9
613	1/10/2024 20:53	Calibration	Pass	0.9
614	1/10/2024 20:53	Calibration	Pass	1
615	1/10/2024 20:53	Calibration	Pass	0.9
728	1/10/2024 22:06	Calibration	Fail	0.7

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
729	1/10/2024 22:06	Calibration	Pass	1
730	1/10/2024 22:06	Calibration	Pass	1
731	1/10/2024 22:06	Calibration	Pass	0.9

Summary

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Bar Joist	9	100.00%	0	0.00%	9	100.00%
2	Ceiling	3	100.00%	0	0.00%	3	100.00%
3	Ceiling I-Beam	1	33.33%	2	66.67%	3	100.00%
4	Door	6	100.00%	0	0.00%	6	100.00%
5	Door Unit	23	100.00%	0	0.00%	23	100.00%
6	Electrical Panel	1	100.00%	0	0.00%	1	100.00%
7	Locker	2	100.00%	0	0.00%	2	100.00%
8	Support Post	1	50.00%	1	50.00%	2	100.00%
9	Unit Ventilator	6	100.00%	0	0.00%	6	100.00%
10	Wall	75	100.00%	0	0.00%	75	100.00%
11	Window Casing	1	100.00%	0	0.00%	1	100.00%
12	Window Unit	5	100.00%	0	0.00%	5	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
431		11	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	1.6
442		12	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	1.7
467		15	Wall 3	Support Post	Metal	Green	Positive	2.4

XRF Results

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
340		1	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
341		1	Wall 1	Window Unit	Metal	Green	Negative	0
342		1	Wall 1	Unit Ventilator	Metal	White	Negative	0
343		1	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
344		1	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
345		1	Wall 3	Door Unit	Metal	Green	Negative	0
346		1	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
347		1	Wall 4	Bar Joist	Metal	Brown	Negative	0
348		2	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
349		2	Wall 1	Wall	Tile	White	Negative	0
350		2	Wall 2	Wall	Tile	White	Negative	0
351		2	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
352		2	Wall 2	Door Unit	Metal	Green	Negative	0
353		2	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
354		2	Wall 3	Wall	Tile	White	Negative	0
355		2	Wall 4	Wall	Tile	White	Negative	0
356		2	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
357		3	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
358		3	Wall 1	Wall	Tile	White	Negative	0
359		3	Wall 2	Wall	Tile	White	Negative	0
360		3	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
361		3	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
362		3	Wall 3	Wall	Tile	White	Negative	0
363		3	Wall 4	Wall	Tile	White	Negative	0
364		3	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
365		3	Wall 4	Door Unit	Metal	Green	Negative	0
366		3	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
367		4	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
368		4	Wall 1	Door Unit	Metal	Green	Negative	0
369		4	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
370		4	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
371		4	Wall 3	Unit Ventilator	Metal	White	Negative	0
372		4	Wall 3	Window Unit	Metal	Green	Negative	0
373		4	Wall 3	Bar Joist	Metal	Brown	Negative	0
374		5	Wall 1	Locker	Metal	Brown	Negative	0
375		5	Wall 1	Locker	Metal	Brown	Negative	0
376		5	Wall 1	Wall	Tile	White	Negative	0
377		5	Wall 2	Wall	Tile	White	Negative	0
378		5	Wall 2	Door Unit	Metal	Green	Negative	0
379		5	Wall 3	Wall	Tile	White	Negative	0
380		5	Wall 4	Wall	Tile	White	Negative	0
381		5	Wall 4	Door Unit	Metal	Green	Negative	0
382		5	Wall 4	Door	Metal	Green	Negative	0
383		5	Wall 4	Bar Joist	Metal	Gray	Negative	0
384		6	Wall 4	Bar Joist	Metal	Gray	Negative	0

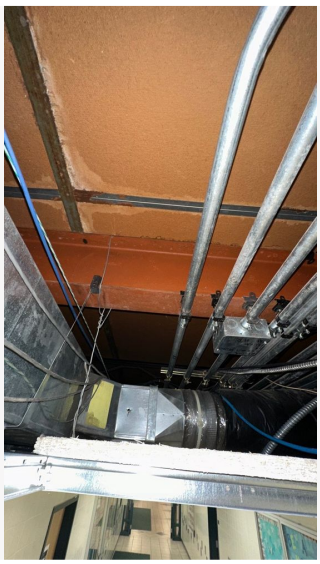
XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
385		7	Wall 1	Wall	Tile	White	Negative	0
386		7	Wall 1	Door Unit	Metal	Green	Negative	0
387		7	Wall 1	Door	Metal	Green	Negative	0
388		7	Wall 2	Wall	Tile	White	Negative	0
389		7	Wall 3	Wall	Tile	White	Negative	0
390		7	Wall 3	Door Unit	Metal	Green	Negative	0
391		7	Wall 4	Wall	Tile	White	Negative	0
392		8	Wall 1	Wall	Tile	White	Negative	0
393		8	Wall 1	Door Unit	Metal	Green	Negative	0
394		8	Wall 3	Wall	Tile	White	Negative	0
395		8	Wall 3	Unit Ventilator	Metal	White	Negative	0
396		8	Wall 3	Electrical Panel	Metal	White	Negative	0
397		8	Wall 4	Door Unit	Metal	Green	Negative	0
398		8	Wall 4	Door	Metal	Green	Negative	0
399		8	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
400		8	Wall 1	Wall	Tile	White	Negative	0
401		8	Wall 2	Wall	Tile	White	Negative	0
402		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
403		8	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0
404		8	Wall 3	Door Unit	Metal	Green	Negative	0
405		8	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
406		8	Wall 3	Wall	Tile	White	Negative	0
407		8	Wall 4	Wall	Tile	White	Negative	0
408		8	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
409		9	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
410		9	Wall 1	Door Unit	Metal	Green	Negative	0
411		9	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
412		9	Wall 2	Wall	Plaster-Gypsum	Brown	Negative	0
413		9	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
414		9	Wall 3	Unit Ventilator	Metal	White	Negative	0
415		9	Wall 3	Window Unit	Metal	Green	Negative	0
416		9	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
417		10	Wall 1	Wall	Tile	White	Negative	0
418		10	Wall 2	Door Unit	Metal	Green	Negative	0
419		10	Wall 2	Door	Metal	Green	Negative	0
420		10	Wall 3	Wall	Tile	White	Negative	0
421		10	Wall 3	Bar Joist	Metal	Black	Negative	0
422		11	Wall 1	Door Unit	Metal	Green	Negative	0
423		11	Wall 1	Door Unit	Metal	Green	Negative	0
424		11	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
425		11	Wall 2	Wall	Tile	White	Negative	0
426		11	Wall 2	Door Unit	Metal	Green	Negative	0
427		11	Wall 4	Support Post	Plaster-Gypsum	Blue	Negative	0
428		11	Wall 4	Door Unit	Metal	Green	Negative	0
429		11	Wall 4	Wall	Tile	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
430		11	Wall 4	Bar Joist	Metal	Black	Negative	0
431		11	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	1.6
432		12	Wall 1	Wall	Tile	White	Negative	0
433		12	Wall 2	Wall	Tile	White	Negative	0
434		12	Wall 2	Door Unit	Metal	Green	Negative	0
435		12	Wall 3	Wall	Tile	White	Negative	0
436		12	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
437		12	Wall 3	Door Unit	Metal	Green	Negative	0
438		12	Wall 4	Wall	Tile	White	Negative	0
439		12	Wall 4	Wall	Brick	Unpainted	Negative	0
440		12	Wall 4	Bar Joist	Metal	Black	Negative	0
441		12	Wall 4	Ceiling I-Beam	Metal	Brown	Negative	0
442		12	Wall 4	Ceiling I-Beam	Metal	Brown	Positive	1.7
443		13	Wall 1	Wall	Brick	Unpainted	Negative	0
444		13	Wall 1	Window Casing	Metal	White	Negative	0
445		13	Wall 2	Door Unit	Metal	Green	Negative	0
446		13	Wall 2	Door	Metal	Green	Negative	0
447		13	Wall 2	Wall	Brick	Unpainted	Negative	0
448		13	Wall 3	Wall	Brick	Unpainted	Negative	0
449		13	Wall 3	Window Unit	Metal	Green	Negative	0
450		13	Wall 4	Wall	Brick	Unpainted	Negative	0
451		14	Wall 1	Wall	Tile	White	Negative	0
452		14	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
453		14	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
454		14	Wall 2	Wall	Tile	White	Negative	0
455		14	Wall 3	Wall	Tile	White	Negative	0
456		14	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
457		14	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0
458		14	Wall 3	Door Unit	Metal	Green	Negative	0
459		14	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
460		14	Wall 4	Wall	Tile	White	Negative	0
461		15	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
462		15	Wall 1	Door Unit	Metal	Green	Negative	0
463		15	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
464		15	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
465		15	Wall 3	Unit Ventilator	Metal	White	Negative	0
466		15	Wall 3	Window Unit	Metal	Green	Negative	0
467		15	Wall 3	Support Post	Metal	Green	Positive	2.4
468		15	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
469		15	Wall 4	Bar Joist	Metal	Black	Negative	0
470		16	Wall 1	Unit Ventilator	Metal	White	Negative	0.1
471		16	Wall 1	Wall	Tile	White	Negative	0
472		16	Wall 2	Door Unit	Metal	Green	Negative	0
473		16	Wall 2	Door	Metal	Green	Negative	0
474		16	Wall 3	Wall	Tile	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
475		16	Wall 3	Bar Joist	Metal	Black	Negative	0

Confirmed Positive Component Types

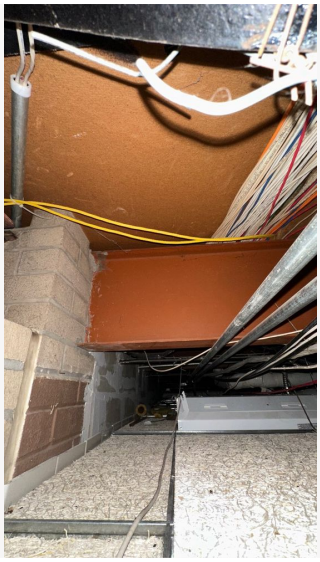
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Roxboro road elem
Ceiling I-beam

Project: B&L North Sryacuse SD
Date: 1/10/2024, 6:07pm
Creator: Daryl Heffron
Tags: Roxboro Elem

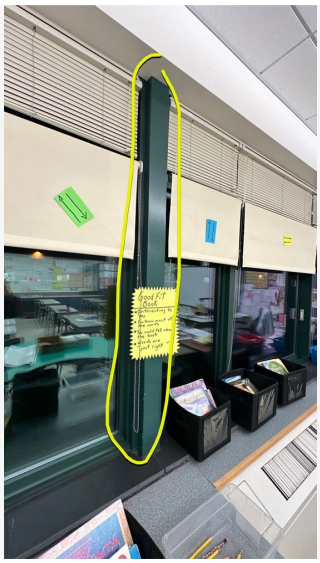
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Roxboro rm12
Ceiling I-Beam

Project: B&L North Sryacuse SD
Date: 1/10/2024, 6:18pm
Creator: Daryl Heffron
Tags: Roxboro Elem

3



Roxboro rm15
Support post

Project: B&L North Sryacuse SD
Date: 1/10/2024, 6:28pm
Creator: Daryl Heffron
Tags: Roxboro Elem

Signature Page

The Individual listed below completed XRF testing at the Roxboro Road Elementary School Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

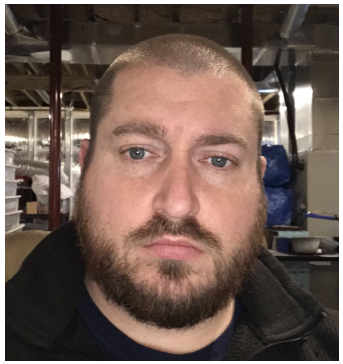
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

CNS-Roxboro Road Middle School
300 Bernard Street
Syracuse, NY 13211

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/15/2024

1/15/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: CNS-Roxboro Road Middle School
300 Bernard Street
Syracuse, NY 13211

Dear Ron:
On January 10, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 300 Bernard Street, Syracuse, NY 13211

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

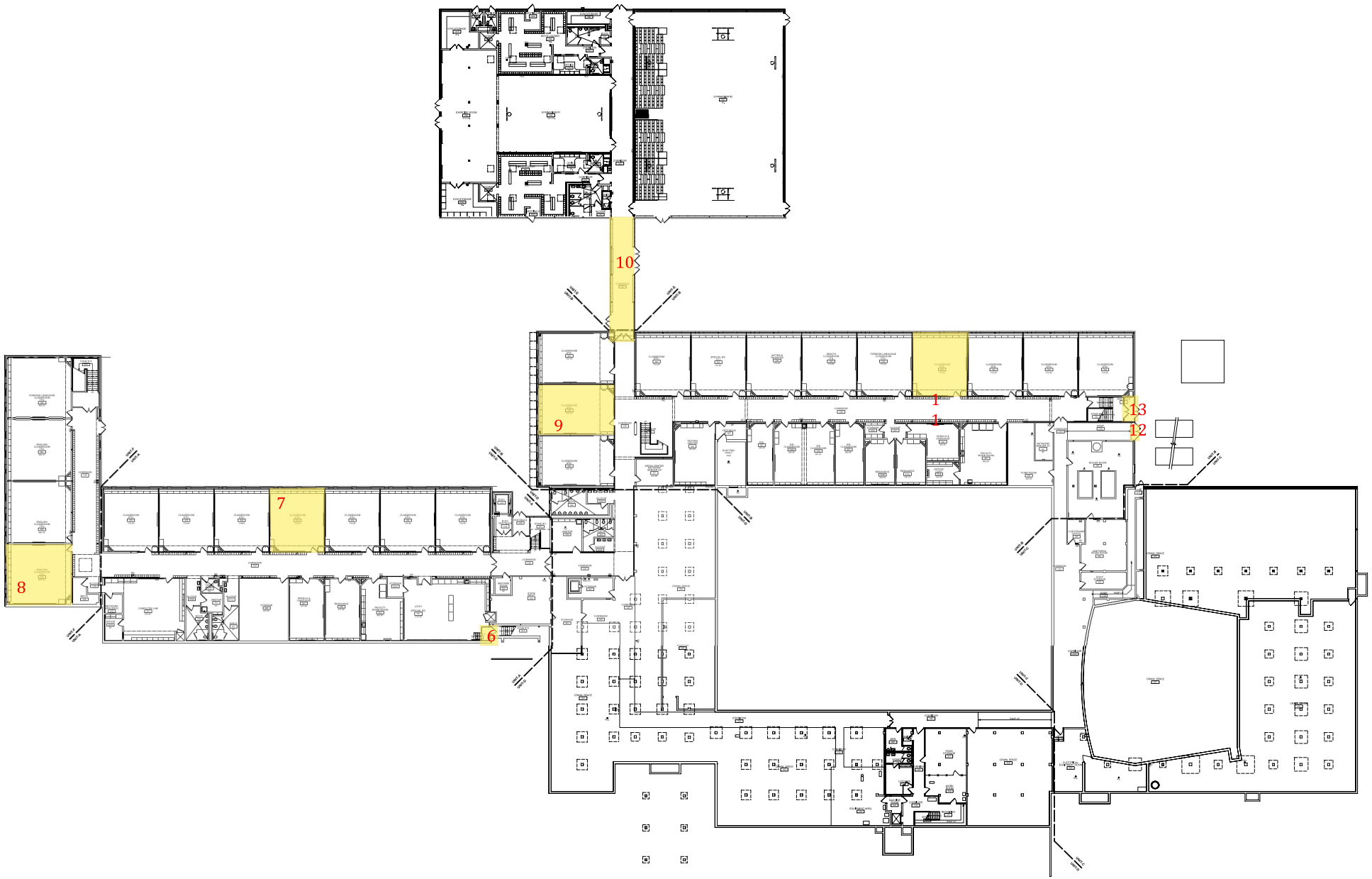
Metal: Ceiling I-Beam (1) Support Post (3)

If you have any questions regarding this report, please feel free to give us a call at any time.

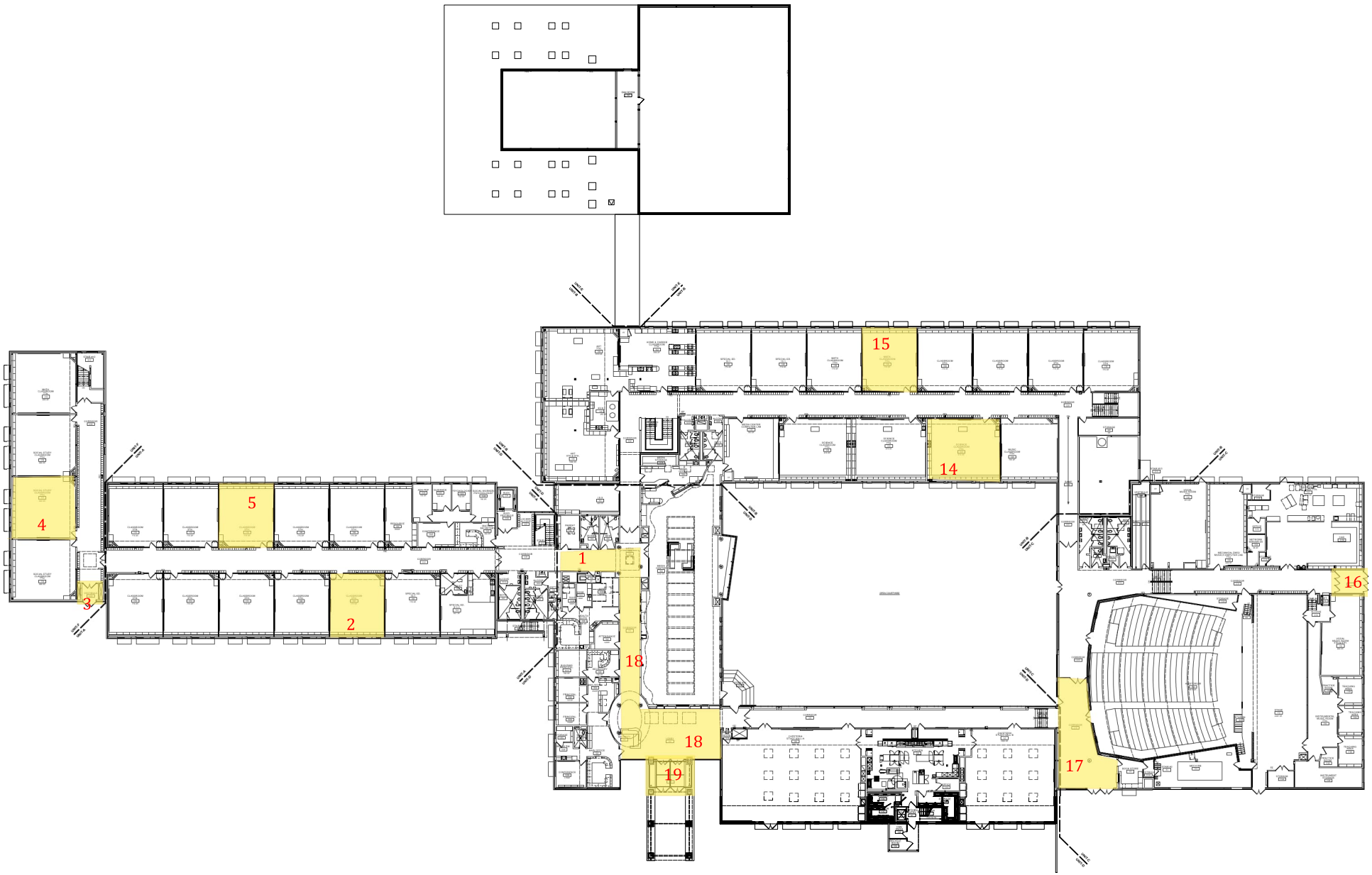
Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



SK-0 ROXBORO MIDDLE SCHOOL - GROUND FLOOR PLAN
Scale: 1/16" = 1'-0"



SK-1 ROXBORO MIDDLE SCHOOL - FIRST FLOOR PLAN
Scale: 1/16" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/10/2024 9:03	Calibration	Pass	0.9
2	1/10/2024 9:03	Calibration	Pass	1
3	1/10/2024 9:03	Calibration	Pass	0.9
4	1/10/2024 9:03	Calibration	Pass	0.9
112	1/10/2024 10:21	Calibration	Pass	1.1
113	1/10/2024 10:21	Calibration	Pass	1
114	1/10/2024 10:21	Calibration	Pass	1.1
115	1/10/2024 10:21	Calibration	Pass	1.1
116	1/10/2024 10:37	Calibration	Pass	0.9
117	1/10/2024 10:38	Calibration	Pass	0.9
118	1/10/2024 10:38	Calibration	Pass	0.9
119	1/10/2024 10:38	Calibration	Pass	0.9
145	1/10/2024 11:06	Calibration	Pass	0.8
146	1/10/2024 11:06	Calibration	Pass	0.9
147	1/10/2024 11:06	Calibration	Pass	0.9
148	1/10/2024 11:06	Calibration	Pass	0.9
149	1/10/2024 12:47	Calibration	Pass	0.9
150	1/10/2024 12:47	Calibration	Pass	0.9
151	1/10/2024 12:47	Calibration	Pass	1
152	1/10/2024 12:47	Calibration	Pass	0.9
206	1/10/2024 13:27	Calibration	Fail	0.8
207	1/10/2024 13:27	Calibration	Pass	1
208	1/10/2024 13:28	Calibration	Pass	1
209	1/10/2024 13:28	Calibration	Pass	0.9
210	1/10/2024 14:13	Calibration	Pass	0.9
211	1/10/2024 14:13	Calibration	Pass	1
212	1/10/2024 14:13	Calibration	Pass	0.9
213	1/10/2024 14:13	Calibration	Pass	0.9
332	1/10/2024 15:22	Calibration	Pass	1
333	1/10/2024 15:22	Calibration	Pass	1
334	1/10/2024 15:22	Calibration	Pass	1
335	1/10/2024 15:22	Calibration	Pass	1
336	1/10/2024 17:06	Calibration	Pass	1
337	1/10/2024 17:06	Calibration	Pass	1
338	1/10/2024 17:06	Calibration	Pass	1
339	1/10/2024 17:06	Calibration	Pass	1
607	1/10/2024 20:13	Calibration	Pass	0.9
608	1/10/2024 20:13	Calibration	Pass	0.9
609	1/10/2024 20:13	Calibration	Pass	1
610	1/10/2024 20:14	Calibration	Pass	0.9
612	1/10/2024 20:53	Calibration	Pass	0.9
613	1/10/2024 20:53	Calibration	Pass	0.9
614	1/10/2024 20:53	Calibration	Pass	1
615	1/10/2024 20:53	Calibration	Pass	0.9
728	1/10/2024 22:06	Calibration	Fail	0.7

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
729	1/10/2024 22:06	Calibration	Pass	1
730	1/10/2024 22:06	Calibration	Pass	1
731	1/10/2024 22:06	Calibration	Pass	0.9

Summary

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: Roxboro Road Middle School
300 Bernard Street, Syracuse, NY 13211

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Bar Joist	11	100.00%	0	0.00%	11	100.00%
2	Ceiling	2	100.00%	0	0.00%	2	100.00%
3	Ceiling I-Beam	1	50.00%	1	50.00%	2	100.00%
4	Door	9	100.00%	0	0.00%	9	100.00%
5	Door Casing	6	100.00%	0	0.00%	6	100.00%
6	Door Unit	17	100.00%	0	0.00%	17	100.00%
7	Hand Rail	1	100.00%	0	0.00%	1	100.00%
8	Radiator	1	100.00%	0	0.00%	1	100.00%
9	Stair Tread	1	100.00%	0	0.00%	1	100.00%
10	Support Post	2	40.00%	3	60.00%	5	100.00%
11	Unit Ventilator	1	100.00%	0	0.00%	1	100.00%
12	Wall	61	100.00%	0	0.00%	61	100.00%
13	Window Unit	14	100.00%	0	0.00%	14	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
542		10	Wall 2	Support Post	Metal	Green	Positive	2.5
543		10	Wall 4	Support Post	Metal	Green	Positive	1.6
548		10	Wall 4	Ceiling I-Beam	Metal	Gray	Positive	1
599		19	Wall 1	Support Post	Metal	Green	Positive	2.6

XRF Results

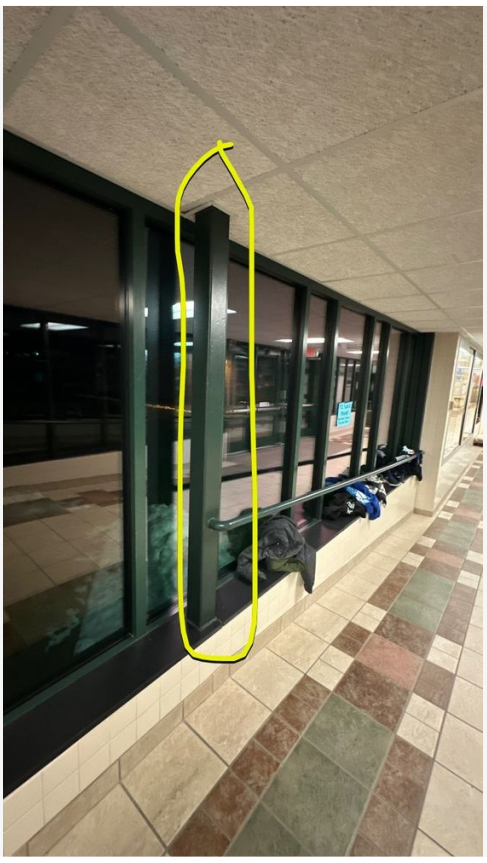
XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
476		1	Wall 1	Wall	Tile	White	Negative	0
477		1	Wall 1	Door Unit	Metal	Green	Negative	0
478		1	Wall 3	Door Unit	Metal	Green	Negative	0
479		1	Wall 3	Wall	Tile	White	Negative	0
480		1	Wall 3	Bar Joist	Metal	Black	Negative	0
481		2	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
482		2	Wall 1	Window Unit	Metal	Green	Negative	0
483		2	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
484		2	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
485		2	Wall 3	Door Casing	Wood	Unpainted	Negative	0
486		2	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
487		3	Wall 1	Wall	Tile	White	Negative	0
488		3	Wall 1	Door Unit	Metal	Green	Negative	0
489		3	Wall 1	Door	Metal	Green	Negative	0
490		3	Wall 2	Wall	Tile	White	Negative	0
491		3	Wall 3	Wall	Tile	White	Negative	0
492		3	Wall 4	Wall	Tile	White	Negative	0
493		3	Wall 4	Radiator	Metal	White	Negative	0
494		3	Wall 4	Bar Joist	Metal	Gray	Negative	0
495		4	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
496		4	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
497		4	Wall 2	Window Unit	Metal	Green	Negative	0
498		4	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
499		4	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
500		4	Wall 4	Door Unit	Metal	Green	Negative	0
501		4	Wall 4	Support Post	Metal	Gray	Negative	0
502		5	Wall 1	Door Casing	Wood	Unpainted	Negative	0
503		5	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
504		5	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
505		5	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
506		5	Wall 3	Window Unit	Metal	Green	Negative	0
507		5	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
508		5	Wall 4	Bar Joist	Metal	Gray	Negative	0
509		6	Wall 1	Hand Rail	Metal	Green	Negative	0
510		6	Wall 1	Stair Tread	Masonry	Green	Negative	0
511		6	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
512		6	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
513		6	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
514		6	Wall 4	Door Unit	Metal	Green	Negative	0
515		6	Wall 4	Door	Metal	Green	Negative	0
516		7	Wall 1	Door Casing	Wood	Unpainted	Negative	0
517		7	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
518		7	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
519		7	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
520		7	Wall 3	Window Unit	Metal	Green	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
521		7	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
522		7	Wall 4	Bar Joist	Metal	Black	Negative	0
523		8	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
524		8	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
525		8	Wall 2	Window Unit	Metal	Green	Negative	0
526		8	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
527		8	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
528		8	Wall 4	Door Unit	Metal	Green	Negative	0
529		8	Wall 4	Ceiling I-Beam	Metal	Brown	Negative	0
530		9	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
531		9	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
532		9	Wall 2	Window Unit	Metal	Green	Negative	0
533		9	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
534		9	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
535		9	Wall 4	Door Casing	Wood	Unpainted	Negative	0
536		9	Wall 4	Bar Joist	Metal	Black	Negative	0
537		10	Wall 1	Door Unit	Metal	Green	Negative	0
538		10	Wall 1	Door	Metal	Green	Negative	0
539		10	Wall 2	Door	Metal	Green	Negative	0
540		10	Wall 2	Door Unit	Metal	Green	Negative	0
541		10	Wall 2	Window Unit	Metal	Green	Negative	0
542		10	Wall 2	Support Post	Metal	Green	Positive	2.5
543		10	Wall 4	Support Post	Metal	Green	Positive	1.6
544		10	Wall 4	Window Unit	Metal	Green	Negative	0
545		10	Wall 4	Door Unit	Metal	Green	Negative	0
546		10	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
547		10	Wall 4	Bar Joist	Metal	Black	Negative	0
548		10	Wall 4	Ceiling I-Beam	Metal	Gray	Positive	1
549		11	Wall 1	Door Casing	Wood	Unpainted	Negative	0
550		11	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
551		11	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
552		11	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
553		11	Wall 3	Window Unit	Metal	Green	Negative	0
554		11	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
555		11	Wall 4	Bar Joist	Metal	Black	Negative	0
556		12	Wall 4	Door Unit	Metal	Green	Negative	0
557		12	Wall 4	Door	Metal	Green	Negative	0
558		13	Wall 4	Door	Metal	Green	Negative	0
559		13	Wall 4	Door Unit	Metal	Green	Negative	0
560		13	Wall 4	Wall	Tile	White	Negative	0
561		13	Wall 1	Wall	Tile	White	Negative	0
562		14	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
563		14	Wall 1	Window Unit	Metal	Green	Negative	0
564		14	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
565		14	Wall 3	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
566		14	Wall 3	Door Unit	Metal	Green	Negative	0
567		14	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
568		14	Wall 4	Bar Joist	Metal	Black	Negative	0
569		15	Wall 1	Bar Joist	Metal	Black	Negative	0
570		15	Wall 1	Door Casing	Wood	Unpainted	Negative	0
571		15	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
572		15	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
573		15	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
574		15	Wall 3	Window Unit	Metal	Green	Negative	0
575		15	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
576		16	Wall 1	Wall	Tile	White	Negative	0
577		16	Wall 2	Door Unit	Metal	Green	Negative	0
578		16	Wall 2	Door	Metal	Green	Negative	0
579		16	Wall 3	Wall	Tile	White	Negative	0
580		16	Wall 4	Door Unit	Metal	Green	Negative	0
581		17	Wall 1	Door Unit	Metal	Green	Negative	0
582		17	Wall 1	Door	Metal	Green	Negative	0
583		17	Wall 1	Window Unit	Metal	Green	Negative	0
584		17	Wall 1	Wall	Tile	White	Negative	0
585		17	Wall 2	Wall	Tile	White	Negative	0
586		17	Wall 3	Wall	Tile	White	Negative	0
587		17	Wall 4	Wall	Wood	Unpainted	Negative	0
588		17	Wall 4	Unit Ventilator	Metal	Green	Negative	0
589		17	Wall 4	Bar Joist	Metal	Black	Negative	0
590		18	Wall 1	Wall	Tile	White	Negative	0
591		18	Wall 1	Window Unit	Metal	Green	Negative	0
592		18	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
593		18	Wall 2	Wall	Tile	White	Negative	0
594		18	Wall 2	Wall	Tile	Green	Negative	0
595		18	Wall 2	Support Post	Masonry	Gray	Negative	0
596		18	Wall 3	Wall	Tile	White	Negative	0
597		18	Wall 4	Wall	Tile	White	Negative	0
598		18	Wall 4	Bar Joist	Metal	Black	Negative	0
599		19	Wall 1	Support Post	Metal	Green	Positive	2.6
600		19	Wall 1	Door Unit	Metal	Green	Negative	0
601		19	Wall 1	Wall	Brick	Unpainted	Negative	0
602		19	Wall 2	Wall	Brick	Unpainted	Negative	0
603		19	Wall 2	Door Unit	Metal	Green	Negative	0
604		19	Wall 2	Door	Metal	Green	Negative	0
605		19	Wall 3	Window Unit	Metal	Green	Negative	0
606		19	Wall 4	Wall	Tile	White	Negative	0

Confirmed Positive Component Types

1



Roxboro MS
Rm10 support post

Project: B&L North Sryacuse SD
Date: 1/10/2024, 7:33pm
Creator: Daryl Heffron
Tags: Roxboro Middle

2



Roxboro ms
Rm10
Ceiling I-Beam

Project: B&L North Sryacuse SD
Date: 1/10/2024, 7:36pm
Creator: Daryl Heffron
Tags: Roxboro Middle

Signature Page

The Individual listed below completed XRF testing at the Roxboro Road Middle School Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

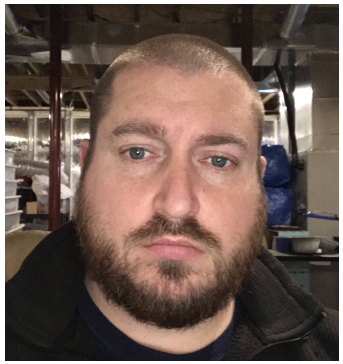
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

Main Street Early Education School
205 S Main Street
N Syracuse, NY 13212

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

1/15/2024

1/15/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: Main Street Early Education School
205 S Main Street
N Syracuse, NY 13212

Dear Ron:
On January 8, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested most of the selected rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 205 S Main Street, N Syracuse, NY 13212

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

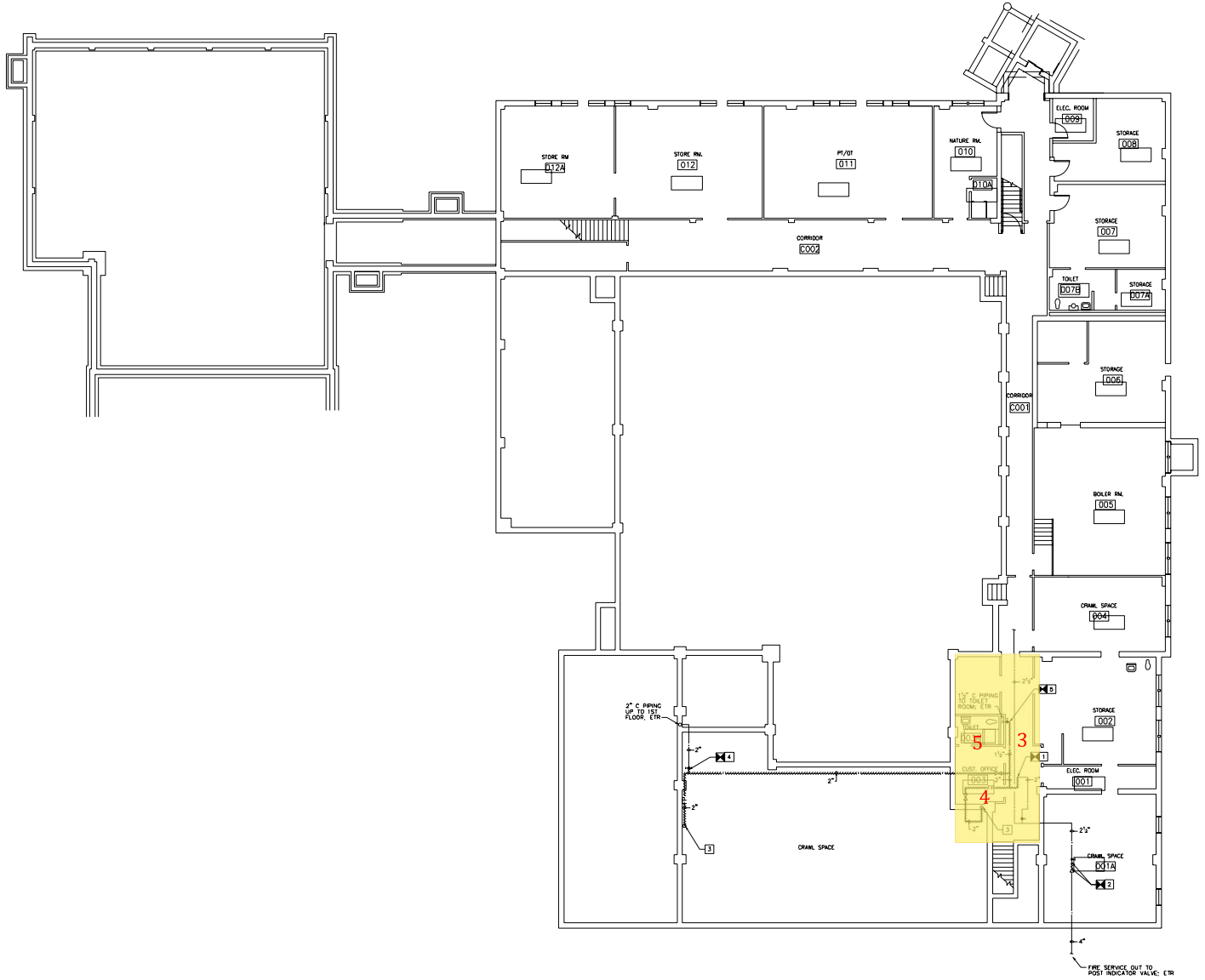
Masonry: Ceiling (1) Floor (1) Wall (6)
Metal: Door Unit (4) Pipe (1)
Plaster-Gypsum: Wall (7)
Wood: Baseboard (2) Door (2)

If you have any questions regarding this report, please feel free to give us a call at any time.

Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

Floor Plans



BASEMENT PLAN – PLUMBING / FIRE PROTECTION DEMOLITION 1

1/8" = 1'-0"

REMOVAL NOTES:

1. DISCONNECT AND REMOVE 2" FP PIPING FROM LOCATION SHOWN AND PREPARE FOR NEW CONNECTION.
2. DISCONNECT AND REMOVE GALVANIZED PIPING COUPLING. PREPARE DUCTILE IRON SERVICE PIPING AND COPPER DISTRIBUTION PIPING FOR NEW CONNECTION.
3. REMOVE 2" FP PIPING UP TO FIRST FLOOR.
4. DISCONNECT AND REMOVE 2" DOMESTIC C PIPING FROM LOCATION SHOWN AND PREPARE FOR NEW CONNECTION.
5. DISCONNECT AND REMOVE 1½" DOMESTIC C PIPING FROM LOCATION SHOWN AND PREPARE FOR NEW CONNECTION.

GENERAL PLUMBING NOTES:

A. DO NOT SHUT DOWN ANY PLUMBING, FIRE PROTECTION OR RELATED SYSTEM WITHOUT BUILDING OWNER'S PRIOR WRITTEN APPROVAL. FOLLOW ALL OWNER REQUIREMENTS AND SHUT DOWN PROCEDURES AS WELL AS ALL REQUIREMENTS OF THIS PROJECT'S CONTRACT DOCUMENTS (PLANS AND SPECIFICATIONS).

B. IF REQUIRED, PROVIDE SHUT DOWNS AND TIE-INS ON OFF HOURS TO AVOID DISRUPTION OF BUILDING SYSTEMS. COORDINATE ALL SHUT DOWN REQUIREMENTS PRIOR TO SUBMITTING BID (INCLUDE ALL WORK REQUIRED DURING OFF HOURS IN BID).

C. PROVIDE ALL WORK IN COMPLIANCE WITH ALL LOCAL, STATE AND FEDERAL CODES. OBTAIN ALL REQUIRED PERMITS. COORDINATE ALL WORK WITH LOCAL FIRE MARSHAL.

D. FIELD VERIFY EXACT LOCATION, COMPOSITION AND CONDITION OF ALL PIPING, VALVES AND SYSTEMS AS REQUIRED FOR WORK OF THE CONTRACT.

E. PROVIDE CUTTING, CORING AND PATCHING OF ALL WALLS, SLABS AND DECKS AS REQUIRED FOR WORK SHOWN. COORDINATE ALL WORK WITH OWNER AND GENERAL CONTRACTOR.

F. COORDINATE SPRINKLER SYSTEM WITH ALL OTHER TRADES, BUILDING CONDITIONS, ETC. OFFSET SPRINKLER SYSTEM PIPING AS REQUIRED (PROVIDE ALL FITTINGS, CONNECTIONS, ETC.).

PLUMBING SYMBOLS LIST

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	EXISTING PIPING		DOMESTIC COLD WATER PIPING
	NEW TO EXISTING CONNECTION		ELBOW UP, ELBOW DOWN
	REMOVE TO THIS POINT		DROP CONNECTION
	WORK TO BE REMOVED		SHUT OFF VALVE
—FP—	FIRE PROTECTION PIPING		PIPE SIZE REDUCER FITTING

king+king ARCHITECTS

NORTH SYRACUSE CENTRAL SCHOOL DISTRICT
MAIN STREET SCHOOL RENOVATIONS

205 S MAIN STREET
NORTH SYRACUSE, NY 13212

K+K PROJECT NO.: 2364144

SED PROJECT NUMBER:
40-03-03-06-0-010-018

UBC Engineering P.C.

STATE OF NEW YORK
ALAN D. BAUM
EXP. 03/31/2024

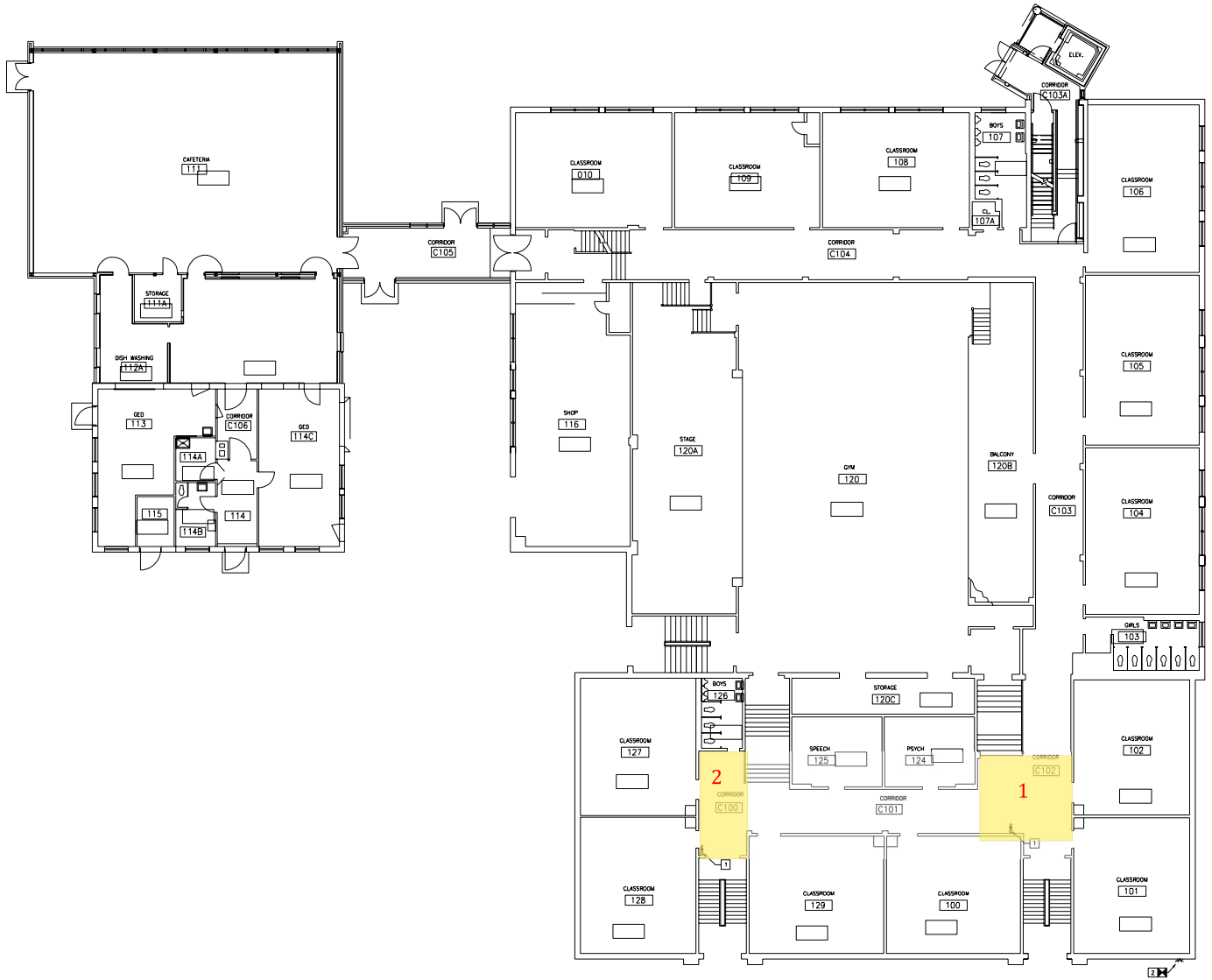
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MARK	DATE	DESCRIPTION

DRAWING DATE: 07/31/2023
DRAWN BY: BAJ
SCALE: As Noted
DRAWING TITLE:

BASEMENT PLAN - PLUMBING / FIRE PROTECTION DEMOLITION

P1.01



FIRST FLOOR PLAN – FIRE PROTECTION DEMOLITION 1

1/8" = 1'-0"

REMOVAL NOTES:

1. REMOVE 2" FP HOSE VALVE RISER AND HOSE VALVE COMPLETE. PROVIDE PATCHING OF FLOOR AND CEILING TO MATCH EXISTING.
2. DISCONNECT AND REMOVE EXISTING FIRE DEPARTMENT CONNECTION. PREPARE 4" FP PIPING FOR NEW CONNECTION.

GENERAL FIRE PROTECTION NOTES:

A. DO NOT SHUT DOWN ANY FIRE PROTECTION OR RELATED SYSTEM WITHOUT BUILDING OWNER'S PRIOR WRITTEN APPROVAL. FOLLOW ALL OWNER REQUIREMENTS AND SHUT DOWN PROCEDURES AS WELL AS ALL REQUIREMENTS OF THIS PROJECTS CONTRACT DOCUMENTS (PLANS AND SPECIFICATIONS)

B. IF REQUIRED, PROVIDE SHUT DOWNS AND TIE-INS ON OFF HOURS TO AVOID DISRUPTION OF BUILDING SYSTEMS. COORDINATE ALL SHUT DOWN REQUIREMENTS PRIOR TO SUBMITTING BID (INCLUDE ALL WORK REQUIRED DURING OFF HOURS IN BID)

C. PROVIDE ALL WORK IN COMPLIANCE WITH ALL LOCAL, STATE AND FEDERAL CODES. OBTAIN ALL REQUIRED PERMITS. COORDINATE ALL WORK WITH LOCAL FIRE MARSHAL.

D. FIELD VERIFY EXACT LOCATION, COMPOSITION AND CONDITION OF ALL PIPING, VALVES AND SYSTEMS AS REQUIRED FOR WORK OF THE CONTRACT.

E. PROVIDE CUTTING, CORING AND PATCHING OF ALL WALLS, SLABS AND DECKS AS REQUIRED FOR WORK SHOWN. COORDINATE ALL WORK WITH OWNER AND GENERAL CONTRACTOR.

FIRE PROTECTION SYMBOLS LIST

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—×—×—	EXISTING PIPING	FDC	FIRE DEPARTMENT CONNECTION
⊕	NEW TO EXISTING CONNECTION	○– ←	ELBOW UP, ELBOW DOWN
⊠	REMOVE TO THIS POINT	—○—	DROP CONNECTION
~~	WORK TO BE REMOVED	⋈	SHUT OFF VALVE
—FP—	FIRE PROTECTION MAIN		

king+king ARCHITECTS

NORTH SYRACUSE CENTRAL SCHOOL DISTRICT
MAIN STREET SCHOOL RENOVATIONS

205 S MAIN STREET
NORTH SYRACUSE, NY 13212

KING+KING PROJ. NO.: 23044144

SED PROJECT NUMBER:
40-03-03-06-0-033-018

UBC Engineering P.C.

STATE OF NEW YORK
ALAN D. BRUNO
EXP. 03/31/2024

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MARK	DATE	DESCRIPTION

DRAWING DATE: 07/21/2023
DRAWN BY: BAJ
SCALE: As Noted
REVIEWED BY:

FIRST FLOOR PLAN - FIRE PROTECTION DEMOLITION

F1.01

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	1/8/2024 18:50	Calibration	Pass	1.1
2	1/8/2024 18:50	Calibration	Pass	1.1
3	1/8/2024 18:51	Calibration	Pass	1.1
4	1/8/2024 18:53	Calibration	Pass	1.1
70	1/8/2024 18:55	Calibration	Pass	1.1
71	1/8/2024 18:55	Calibration	Pass	1
72	1/8/2024 18:55	Calibration	Pass	1
73	1/8/2024 18:57	Calibration	Pass	1
314	1/8/2024 18:58	Calibration	Pass	0.9
315	1/8/2024 18:58	Calibration	Pass	1
316	1/8/2024 18:58	Calibration	Pass	1
317	1/8/2024 18:58	Calibration	Pass	1
318	1/8/2024 18:58	Calibration	Pass	0.8
319	1/8/2024 18:59	Calibration	Pass	0.8
320	1/8/2024 18:59	Calibration	Pass	0.9
321	1/8/2024 18:59	Calibration	Pass	0.8
380	1/8/2024 19:00	Calibration	Pass	0.9
381	1/8/2024 19:00	Calibration	Pass	0.8
382	1/8/2024 19:00	Calibration	Pass	0.9
383	1/8/2024 19:01	Calibration	Pass	0.9
384	1/8/2024 19:01	Calibration	Pass	0.9
385	1/8/2024 19:01	Calibration	Pass	0.8
386	1/8/2024 19:02	Calibration	Pass	0.9
387	1/8/2024 19:02	Calibration	Pass	0.9
388	1/8/2024 19:02	Calibration	Pass	0.8
513	1/8/2024 19:05	Calibration	Pass	0.9
514	1/8/2024 19:05	Calibration	Pass	0.9
515	1/8/2024 19:05	Calibration	Pass	0.9
516	1/8/2024 19:05	Calibration	Pass	0.9

Summary

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: Main Street Early Education
205 S Main Street, N Syracuse, NY 13212

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Baluster	1	100.00%	0	0.00%	1	100.00%
2	Baseboard	0	0.00%	2	100.00%	2	100.00%
3	Ceiling	2	40.00%	3	60.00%	5	100.00%
4	Ceiling I-Beam	1	100.00%	0	0.00%	1	100.00%
5	Chair Rail	2	100.00%	0	0.00%	2	100.00%
6	Door	1	33.33%	2	66.67%	3	100.00%
7	Door Casing	4	100.00%	0	0.00%	4	100.00%
8	Door Unit	1	20.00%	4	80.00%	5	100.00%
9	Floor	2	66.67%	1	33.33%	3	100.00%
10	Newel Post	2	100.00%	0	0.00%	2	100.00%
11	Pipe	0	0.00%	1	100.00%	1	100.00%
12	Stair Header	1	100.00%	0	0.00%	1	100.00%
13	Stair Stringer	1	100.00%	0	0.00%	1	100.00%
14	Top Rail	1	100.00%	0	0.00%	1	100.00%
15	Wall	11	45.83%	13	54.17%	24	100.00%
16	Wall I-Beam	1	100.00%	0	0.00%	1	100.00%
17	Wall Molding	1	100.00%	0	0.00%	1	100.00%

Confirmed Positives

Confirmed Positives

Reading #	Room	Tested #	Wall	Component	Substrate	Color	Results	mg/cm2
322		1	Wall 1	Wall	Plaster-Gypsum	White	Positive	2.3
327		1	Wall 1	Baseboard	Wood	White	Positive	1.8
328		1	Wall 2	Wall	Plaster-Gypsum	White	Positive	2.5
329		1	Wall 2	Wall	Plaster-Gypsum	White	Positive	3.5
339		1	Wall 4	Wall	Plaster-Gypsum	White	Positive	1.2
340		2	Wall 1	Wall	Plaster-Gypsum	White	Positive	2.8
342		2	Wall 1	Baseboard	Wood	White	Positive	2.3
345		2	Wall 1	Pipe	Metal	White	Positive	2.4
346		2	Wall 2	Wall	Plaster-Gypsum	White	Positive	3.3
349		2	Wall 4	Wall	Plaster-Gypsum	White	Positive	2.2
353		3	Wall 1	Wall	Masonry	White	Positive	2.4
354		3	Wall 2	Wall	Masonry	White	Positive	1.1
355		3	Wall 2	Ceiling	Masonry	White	Positive	1.4
356		3	Wall 2	Door Unit	Metal	Green	Positive	6.3
357		3	Wall 3	Door Unit	Metal	Green	Positive	3.9
359		3	Wall 3	Wall	Masonry	White	Positive	4.2
362		3	Wall 4	Wall	Masonry	White	Positive	2
363		4	Wall 1	Wall	Masonry	White	Positive	1.3
364		4	Wall 2	Wall	Masonry	White	Positive	1.3
367		4	Wall 4	Ceiling	Masonry	White	Positive	1.3
368		4	Wall 4	Door Unit	Metal	Green	Positive	2.9
369		4	Wall 4	Door	Wood	Green	Positive	4.2
370		5	Wall 1	Door	Wood	White	Positive	3.3
371		5	Wall 1	Door Unit	Metal	Green	Positive	3.8
373		5	Wall 1	Floor	Masonry	Gray	Positive	3.4
374		5	Wall 1	Ceiling	Masonry	White	Positive	3.1

XRF Results

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: Main Street Early Education
205 S Main Street, N Syracuse, NY 13212

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
322		1	Wall 1	Wall	Plaster-Gypsum	White	Positive	2.3
323		1	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
324		1	Wall 1	Door Casing	Wood	White	Negative	0.1
325		1	Wall 1	Door Casing	Wood	White	Negative	0.1
326		1	Wall 1	Chair Rail	Wood	Green	Negative	0.1
327		1	Wall 1	Baseboard	Wood	White	Positive	1.8
328		1	Wall 2	Wall	Plaster-Gypsum	White	Positive	2.5
329		1	Wall 2	Wall	Plaster-Gypsum	White	Positive	3.5
330		1	Wall 2	Wall Molding	Wood	White	Negative	0
331		1	Wall 3	Newel Post	Metal	White	Negative	0.5
332		1	Wall 3	Baluster	Metal	White	Negative	0.6
333		1	Wall 3	Top Rail	Metal	White	Negative	0.2
334		1	Wall 3	Stair Stringer	Metal	Green	Negative	0.8
335		1	Wall 3	Stair Header	Metal	White	Negative	0.8
336		1	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
337		1	Wall 3	Door Unit	Metal	White	Negative	0
338		1	Wall 3	Door	Metal	White	Negative	0.2
339		1	Wall 4	Wall	Plaster-Gypsum	White	Positive	1.2
340		2	Wall 1	Wall	Plaster-Gypsum	White	Positive	2.8
341		2	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
342		2	Wall 1	Baseboard	Wood	White	Positive	2.3
343		2	Wall 1	Door Casing	Wood	White	Negative	0.1
344		2	Wall 1	Chair Rail	Wood	Green	Negative	0.1
345		2	Wall 1	Pipe	Metal	White	Positive	2.4
346		2	Wall 2	Wall	Plaster-Gypsum	White	Positive	3.3
347		2	Wall 2	Door Casing	Wood	White	Negative	0.1
348		2	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
349		2	Wall 4	Wall	Plaster-Gypsum	White	Positive	2.2
350		2	Wall 4	Newel Post	Metal	White	Negative	0.3
351		3	Wall 1	Floor	Masonry	Gray	Negative	0.7
352		3	Wall 1	Floor	Masonry	Gray	Negative	0.3
353		3	Wall 1	Wall	Masonry	White	Positive	2.4
354		3	Wall 2	Wall	Masonry	White	Positive	1.1
355		3	Wall 2	Ceiling	Masonry	White	Positive	1.4
356		3	Wall 2	Door Unit	Metal	Green	Positive	6.3
357		3	Wall 3	Door Unit	Metal	Green	Positive	3.9
358		3	Wall 3	Wall	Masonry	White	Negative	0.6
359		3	Wall 3	Wall	Masonry	White	Positive	4.2
360		3	Wall 4	Wall	Masonry	White	Negative	0
361		3	Wall 4	Wall	Masonry	White	Negative	0.8
362		3	Wall 4	Wall	Masonry	White	Positive	2
363		4	Wall 1	Wall	Masonry	White	Positive	1.3
364		4	Wall 2	Wall	Masonry	White	Positive	1.3
365		4	Wall 3	Wall	Masonry	White	Negative	0
366		4	Wall 4	Wall	Masonry	White	Negative	0

XRF & Labs								
Reading #	Room	#	Wall	Component	Substrate	Condition	Results	mg/cm2
367		4	Wall 4	Ceiling	Masonry	White	Positive	1.3
368		4	Wall 4	Door Unit	Metal	Green	Positive	2.9
369		4	Wall 4	Door	Wood	Green	Positive	4.2
370		5	Wall 1	Door	Wood	White	Positive	3.3
371		5	Wall 1	Door Unit	Metal	Green	Positive	3.8
372		5	Wall 1	Wall	Masonry	White	Negative	0.6
373		5	Wall 1	Floor	Masonry	Gray	Positive	3.4
374		5	Wall 1	Ceiling	Masonry	White	Positive	3.1
375		5	Wall 2	Wall	Masonry	White	Negative	0.3
376		5	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
377		5	Wall 3	Ceiling I-Beam	Metal	Brown	Negative	0.2
378		5	Wall 4	Wall I-Beam	Metal	White	Negative	0.3
379		5	Wall 4	Wall	Masonry	White	Negative	0.5

Confirmed Positive Component Types

1



Main Street school
Wall & baseboard

Project: B&L North Sryacuse SD
Date: 1/8/2024, 5:10pm
Creator: Daryl Heffron
Tags: Main Street

2



Main Street
Rm2
Walls, pipe & baseboard

Project: B&L North Sryacuse SD
Date: 1/8/2024, 5:17pm
Creator: Daryl Heffron
Tags: Main Street

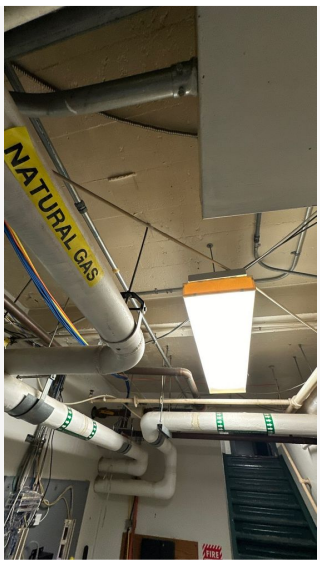
3



Main Street
Rm3
Walls, door unit

Project: B&L North Sryacuse SD
Date: 1/8/2024, 5:24pm
Creator: Daryl Heffron
Tags: Main Street

4



Main Street
Rm 3
Ceiling

Project: B&L North Sryacuse SD
Date: 1/8/2024, 5:24pm
Creator: Daryl Heffron
Tags: Main Street

5



Main Street
Rm4
Walls, ceiling, door unit and door

Project: B&L North Sryacuse SD
Date: 1/8/2024, 5:29pm
Creator: Daryl Heffron
Tags: Main Street

6



Main Street
Rm5
Floor

Project: B&L North Sryacuse SD
Date: 1/8/2024, 5:31pm
Creator: Daryl Heffron
Tags: Main Street

Signature Page

The Individual listed below completed XRF testing at the Main Street Early Education Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

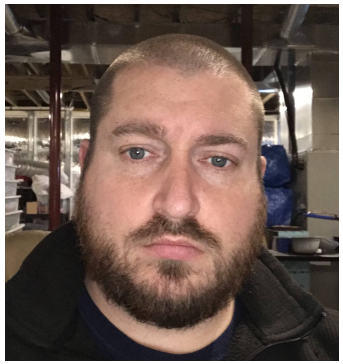
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2024

LBP-R-121052-2

Certification #

February 08, 2021

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Lead-Based Paint XRF Testing Report

Prepared For:

Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

Project:

Gillette Middle School
6150 South Bay Road
Cicero, NY 13039

Conducted by:

Daryl Heffron
LBP-R-121052-2

Eco-Testing Services, LLC.
213 Sydney Terrace
Newfield, NY 14867

10/17/2024

10/17/2024

To:
Ron Thorp
Barton & Loguidice
443 Electronics Parkway
Liverpool, NY 13088

RE: Gillette Middle School
6150 South Bay Road
Cicero, NY 13039

Dear David:

On October 8 & 15, 2024, Eco-Testing Services conducted XRF testing for the presence of lead-based paint, as directed by Barton & Loguidice, at the above captioned location.

The instruments were operated with the guidance from the Performance Characteristics Sheets published by the US Department of HUD and the results classified as positive or negative based the HUD action level of 1.00 mg/cm². Results less than 1.00 mg/cm² are considered negative and results greater than 1.00 mg/cm² are considered positive. For renovation purposes, as well as OSHA implications, it should be noted the lead present in levels less than 1.00 mg/cm² could generate dust that exceeds acceptable levels depending on the renovation or demolition being performed. For OSHA purposes, there are no accepted standards other than "zero" for lead content in surfaces that are affected so as to release lead in the form of dust. XRF readings at the lower end of the range (close to zero) are less likely to create toxic situations. XRF readings with negative prefixes correlate to very low lead levels in that particular surface. For conclusive, task-oriented results, contractors should follow all applicable OSHA requirements found in regulation 1926.62.

The walls in each space oriented in a clockwise fashion, with wall #1 oriented to the front of the building. Please refer to the building plans for clarification. An "NA" indicates that the room was not accessible during testing, and "NP" indicates that there were no painted surfaces within that space. During the testing procedures, Eco-Testing personnel were able to gain access to most of the designated spaces and tested the rooms that were requested.

Summary of Positive Findings

LOCATION ADDRESS: 6150 South Bay Road, Cicero, NY 13039

Positive test results for the presence of lead-based paint in concentrations equal to or greater than 1.00 mg/cm² are:

Positive components by substrate:

Building 1

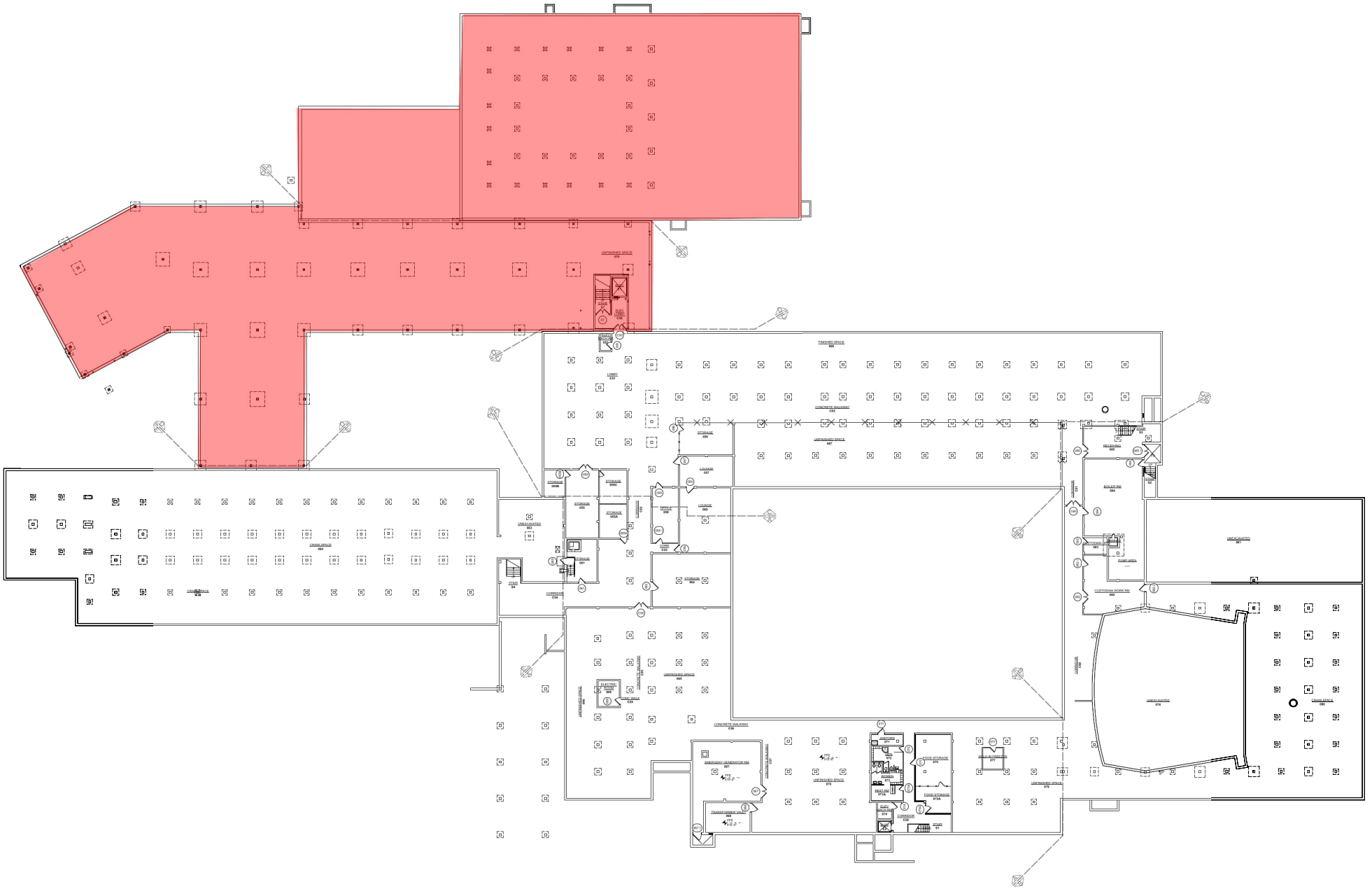
Metal: Ceiling I-Beam (12) Door (1) Door Unit (10) Elevator Door Casing (1) Fire Extinguisher Case (4) Hand Rail (4) Newel Post (1) Roof Access (1) Stair Riser (1) Stair Stringer (2) Stair Tread (1) Support Post (63) Top Rail (1) Wall I-beam

If you have any questions regarding this report, please feel free to give us a call at any time.

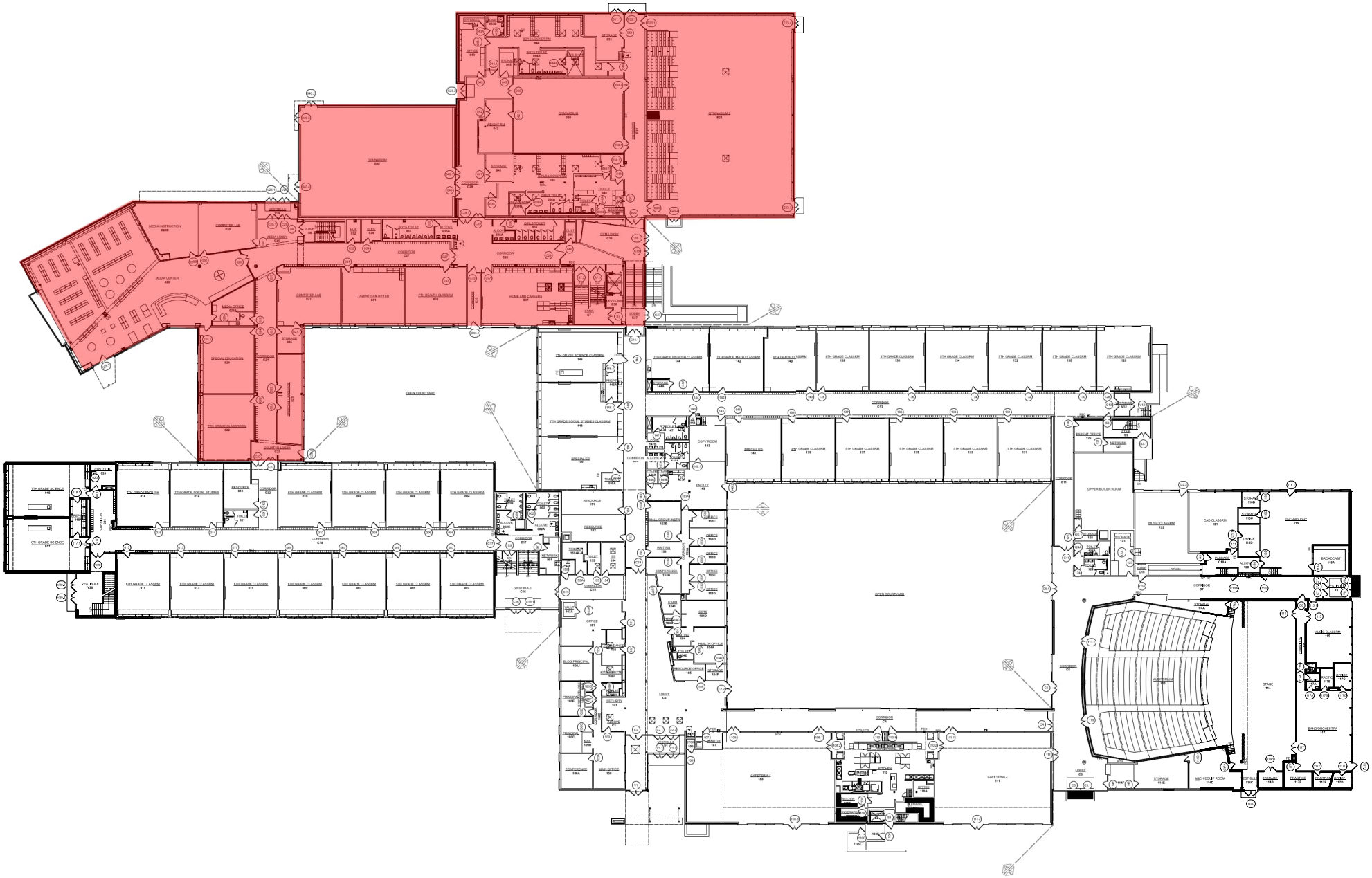
Sincerely Yours,

Daryl Heffron Eco-Testing Services, LLC

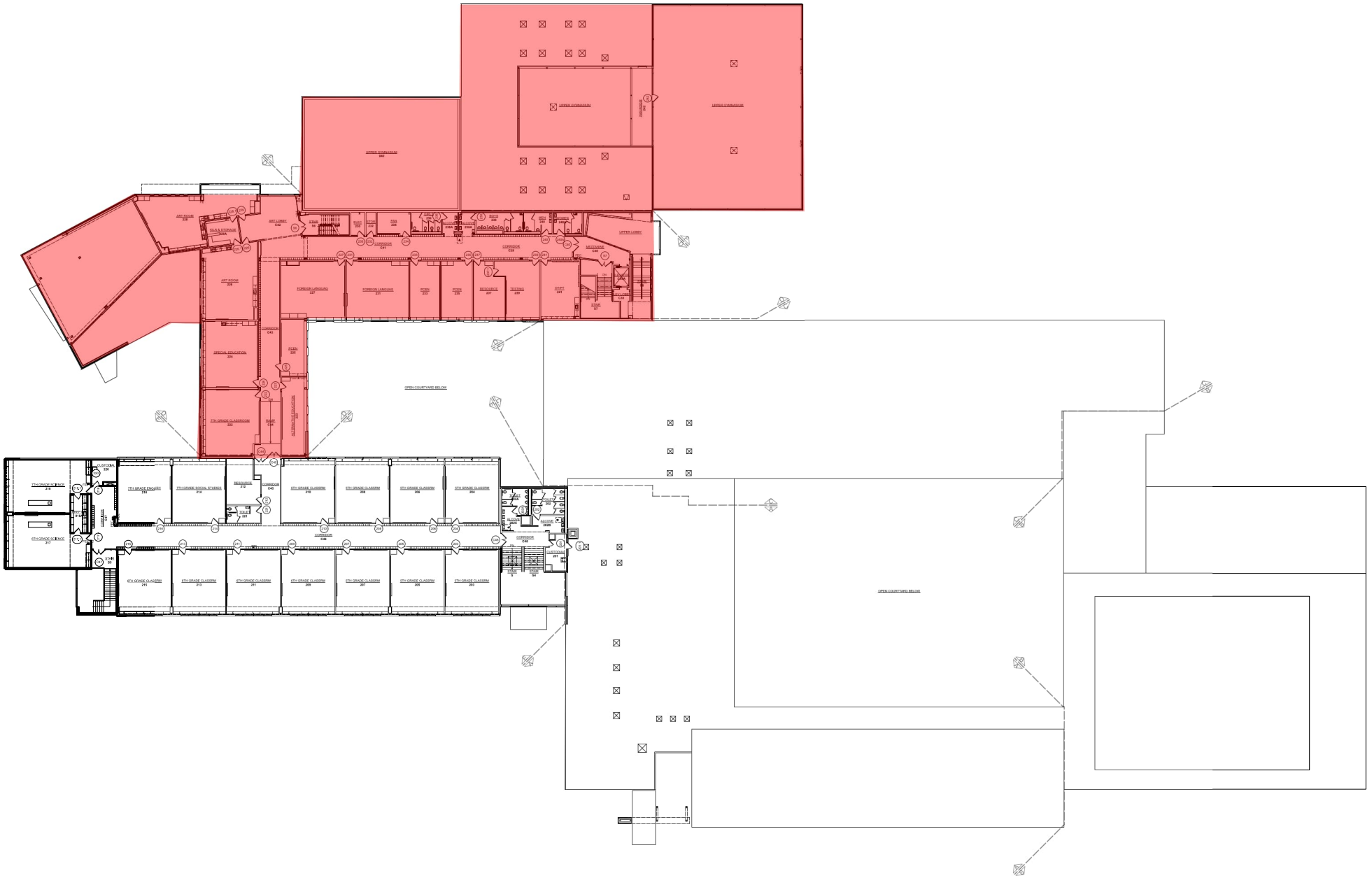
Floor Plans



GILLETTE MS - BASEMENT FLOOR PLAN
SCALE: 1/16" = 1'-0"



GILLETTE MS - FIRST FLOOR PLAN
SCALE: 1/16" = 1'-0"



GILLETTE MS - SECOND FLOOR PLAN
Scale: 1/16" = 1'-0"

Daily Calibrations

Calibrations				
#	Date / Time	Type	Pass / Fail	mg/cm2
1	10/8/2024 15:48	Calibration	Pass	1
2	10/8/2024 15:48	Calibration	Pass	1
3	10/8/2024 15:48	Calibration	Pass	1
4	10/8/2024 15:48	Calibration	Pass	1
613	10/8/2024 21:57	Calibration	Pass	1
614	10/8/2024 21:57	Calibration	Pass	0.9
615	10/8/2024 21:58	Calibration	Pass	1
616	10/8/2024 21:58	Calibration	Pass	1
617	10/8/2024 22:00	Calibration	Pass	1
618	10/8/2024 22:00	Calibration	Pass	0.9
619	10/8/2024 22:00	Calibration	Pass	0.9
620	10/8/2024 22:00	Calibration	Pass	1
646	10/8/2024 22:36	Calibration	Pass	0.9
647	10/8/2024 22:37	Calibration	Pass	1
648	10/8/2024 22:37	Calibration	Pass	0.9
649	10/8/2024 22:37	Calibration	Pass	0.9
1	10/15/2024 18:12	Calibration	Pass	1
2	10/15/2024 18:12	Calibration	Pass	0.9
3	10/15/2024 18:12	Calibration	Pass	1
4	10/15/2024 18:12	Calibration	Pass	1
76	10/15/2024 19:45	Calibration	Pass	1
77	10/15/2024 19:45	Calibration	Pass	0.9
78	10/15/2024 19:45	Calibration	Pass	0.9
79	10/15/2024 19:45	Calibration	Pass	0.9

Summary

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: Gillette Middle School
6150 South Bay Road, Cicero, NY 13039

Summary Analysis							
#	Component	# Tested Negative	% Negative	# Tested Positive	% Positive	Total Tested	Total %
1	Access Door	5	100.00%	0	0.00%	5	100.00%
2	Baluster	3	100.00%	0	0.00%	3	100.00%
3	Bar Joist	19	100.00%	0	0.00%	19	100.00%
4	Baseboard	58	100.00%	0	0.00%	58	100.00%
5	Ceiling	42	100.00%	0	0.00%	42	100.00%
6	Ceiling I-Beam	3	20.00%	12	80.00%	15	100.00%
7	Closet Wall	1	100.00%	0	0.00%	1	100.00%
8	Door	34	97.14%	1	2.86%	35	100.00%
9	Door Casing	59	100.00%	0	0.00%	59	100.00%
10	Door Jamb/Stop	4	100.00%	0	0.00%	4	100.00%
11	Door Unit	99	90.83%	10	9.17%	109	100.00%
12	Drinking Fountain	1	100.00%	0	0.00%	1	100.00%
13	Duct	3	100.00%	0	0.00%	3	100.00%
14	Electrical Panel	3	100.00%	0	0.00%	3	100.00%
15	Elevator Door Casing	0	0.00%	1	100.00%	1	100.00%
16	Fire Ext. Case	6	60.00%	4	40.00%	10	100.00%
17	Floor	20	100.00%	0	0.00%	20	100.00%
18	Hand Rail	16	80.00%	4	20.00%	20	100.00%
19	Heating Grate	5	100.00%	0	0.00%	5	100.00%
20	Ladder	3	100.00%	0	0.00%	3	100.00%
21	Light	3	100.00%	0	0.00%	3	100.00%
22	Locker	24	100.00%	0	0.00%	24	100.00%
23	Louvre	1	100.00%	0	0.00%	1	100.00%
24	Newel Post	1	50.00%	1	50.00%	2	100.00%
25	Overhang	4	100.00%	0	0.00%	4	100.00%
26	Overhead Door	3	100.00%	0	0.00%	3	100.00%
27	Pipe	2	100.00%	0	0.00%	2	100.00%
28	Radiator	1	100.00%	0	0.00%	1	100.00%
29	Roof Access	0	0.00%	1	100.00%	1	100.00%
30	Shelving	2	100.00%	0	0.00%	2	100.00%
31	Shutter	1	100.00%	0	0.00%	1	100.00%
32	Sky Light	1	100.00%	0	0.00%	1	100.00%
33	Stair Landing	1	100.00%	0	0.00%	1	100.00%
34	Stair Riser	1	50.00%	1	50.00%	2	100.00%
35	Stair Stringer	7	77.78%	2	22.22%	9	100.00%
36	Stair Tread	3	75.00%	1	25.00%	4	100.00%
37	Stall	8	100.00%	0	0.00%	8	100.00%
38	Structural Steel	5	100.00%	0	0.00%	5	100.00%
39	Support Post	11	14.86%	63	85.14%	74	100.00%
40	Top Rail	5	83.33%	1	16.67%	6	100.00%
41	Unit Ventilator	64	100.00%	0	0.00%	64	100.00%
42	Wall	700	100.00%	0	0.00%	700	100.00%
43	Wall I-Beam	0	0.00%	4	100.00%	4	100.00%
44	Wall Molding	1	100.00%	0	0.00%	1	100.00%
45	Water Fountain	1	100.00%	0	0.00%	1	100.00%
46	Window Unit	81	100.00%	0	0.00%	81	100.00%

Confirmed Positives

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: Gillette Middle School
6150 South Bay Road, Cicero, NY 13039

Confirmed Positives

Reading #	Room #	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
6	C54	1	Wall 2	Wall I-Beam	Metal	White	Positive	5.7
16	61	2	Wall 1	Door Unit	Metal	Green	Positive	1.5
99	65	12	Wall 3	Door Unit	Metal	Green	Positive	1.1
123	70	15	Wall 2	Door Unit	Metal	Gray	Positive	1.1
124	70	15	Wall 2	Door	Metal	Gray	Positive	7.6
151	58	19	Wall 1	Stair Tread	Metal	Green	Positive	1.1
152	58	19	Wall 1	Stair Riser	Metal	Green	Positive	1.1
157	58	19	Wall 2	Elevator Door Casing	Metal	Green	Positive	1.6
182	82	23	Wall 2	Door Unit	Metal	Green	Positive	1.1
187	82	23	Wall 4	Door Unit	Metal	White	Positive	1.3
193	83	24	Wall 2	Door Unit	Metal	Green	Positive	1.7
200	C61	25	Wall 3	Door Unit	Metal	Green	Positive	1.6
208	84	26	Wall 2	Stair Stringer	Metal	Green	Positive	1.2
211	84	26	Wall 2	Hand Rail	Metal	Green	Positive	1.8
212	84	26	Wall 2	Door Unit	Metal	Green	Positive	1.6
222	85	27	Wall 2	Door Unit	Metal	Green	Positive	1.2
226	85	27	Wall 4	Door Unit	Metal	Green	Positive	1.2
239	128	28	Wall 3	Support Post	Metal	Green	Positive	3.9
245	130	29	Wall 3	Support Post	Metal	Green	Positive	2.5
253	132	30	Wall 3	Support Post	Metal	Green	Positive	3.3
262	134	31	Wall 3	Support Post	Metal	Green	Positive	5.6
268	136	32	Wall 3	Support Post	Metal	Green	Positive	3.8
275	138	33	Wall 3	Support Post	Metal	Green	Positive	4.4
278	138	33	Wall 1	Ceiling I-Beam	Metal	Brown	Positive	4.1
285	140	34	Wall 3	Support Post	Metal	Green	Positive	5.1
295	142	35	Wall 3	Support Post	Metal	Green	Positive	4.7
297	142	35	Wall 1	Ceiling I-Beam	Metal	Brown	Positive	3.8
305	144	36	Wall 3	Support Post	Metal	Green	Positive	4.3
322	146	39	Wall 2	Support Post	Metal	Green	Positive	2.1
331	148	40	Wall 2	Support Post	Metal	Green	Positive	4.1
339	150	41	Wall 2	Support Post	Metal	Green	Positive	2.9
380	143	46	Wall 1	Ceiling I-Beam	Metal	Brown	Positive	3.5
385	141	47	Wall 1	Support Post	Metal	Green	Positive	1.7
393	139	48	Wall 1	Support Post	Metal	Green	Positive	3.2
403	137	49	Wall 1	Support Post	Metal	Green	Positive	3.5
411	135	50	Wall 1	Support Post	Metal	Green	Positive	3.5
422	133	51	Wall 1	Support Post	Metal	Green	Positive	2.1
430	131	52	Wall 1	Support Post	Metal	Green	Positive	2.9
441	C13	53	Wall 1	Fire Ext. Case	Metal	Red	Positive	1.2
463	124A	56	Wall 1	Ceiling I-Beam	Metal	Orange	Positive	5.1
477	122	59	Wall 2	Stair Stringer	Metal	Green	Positive	1.6
506	121	61	Wall 4	Ceiling I-Beam	Metal	White	Positive	5.4
526	118	63	Wall 3	Support Post	Metal	Green	Positive	4.7
527	118	63	Wall 3	Support Post	Metal	Green	Positive	6.7
532	118	63	Wall 4	Ceiling I-Beam	Metal	White	Positive	5.7

Eco-Testing Services, LLC
213 Sydney Terrace, Newfield, NY 14867

Client:
Barton Loguidice

Project: Gillette Middle School
6150 South Bay Road, Cicero, NY 13039

Confirmed Positives

Reading #	Room #	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
534	118A	64	Wall 1	Wall I-Beam	Metal	White	Positive	5.9
548	115	65	Wall 4	Support Post	Metal	Green	Positive	4.6
550	115	65	Wall 1	Ceiling I-Beam	Metal	White	Positive	3.7
557	117	66	Wall 4	Support Post	Metal	Green	Positive	6.4
558	117	66	Wall 1	Ceiling I-Beam	Metal	White	Positive	3.9
581	117C	69	Wall 4	Support Post	Metal	Green	Positive	6.3
605	114	73	Wall 4	Wall I-Beam	Metal	Black	Positive	5.4
619	C6	75	Wall 2	Support Post	Metal	Green	Positive	8
631	C7	76	Wall 1	Fire Ext. Case	Metal	Red	Positive	1.1
636	111	77	Wall 1	Support Post	Metal	Intact	Positive	3.7
650	108	79	Wall 1	Support Post	Metal	Intact	Positive	5.5
663	C4	80	Wall 3	Support Post	Metal	Intact	Positive	4.7
665	C4	80	Wall 3	Ceiling I-Beam	Metal	Intact	Positive	5
673	152	81	Wall 4	Ceiling I-Beam	Metal	Intact	Positive	4.1
677	151	82	Wall 3	Wall I-Beam	Metal	Intact	Positive	5.4
690	201	101	Wall 4	Roof Access	Metal	Green	Positive	1.5
745	203	106	Wall 1	Support Post	Metal	Green	Positive	2.7
753	205	107	Wall 1	Support Post	Metal	Green	Positive	2.4
758	207	108	Wall 1	Support Post	Metal	Green	Positive	1.6
768	209	109	Wall 1	Support Post	Metal	Green	Positive	1.3
776	211	110	Wall 1	Support Post	Metal	Green	Positive	3.1
783	213	111	Wall 1	Support Post	Metal	Green	Positive	3.9
793	215	112	Wall 1	Support Post	Metal	Green	Positive	4.8
802	217	113	Wall 2	Support Post	Metal	Green	Positive	3.7
819	218	115	Wall 2	Support Post	Metal	Green	Positive	2.9
843	216	117	Wall 3	Support Post	Metal	Green	Positive	4.4
851	214	118	Wall 3	Support Post	Metal	Green	Positive	2.8
879	210	121	Wall 3	Support Post	Metal	White	Positive	2.9
886	208	122	Wall 3	Support Post	Metal	Green	Positive	5.1
894	206	123	Wall 3	Support Post	Metal	Green	Positive	1
904	204	124	Wall 3	Support Post	Metal	Green	Positive	1.8
907	C46	125	Wall 1	Ceiling I-Beam	Metal	Intact	Positive	2.6
925	C46	125	Wall 4	Fire Ext. Case	Metal	Red	Positive	1.1
948	S5	127	Wall 4	Hand Rail	Metal	Green	Positive	1.1
949	S5	127	Wall 4	Hand Rail	Metal	Green	Positive	1.2
950	S5	127	Wall 4	Top Rail	Metal	Green	Positive	1
954	S5	127	Wall 4	Newel Post	Metal	Green	Positive	1
956	S4	128	Wall 1	Ceiling I-Beam	Metal	Intact	Positive	3.4
966	S4	128	Wall 3	Hand Rail	Metal	Green	Positive	1
975	17	129	Wall 2	Support Post	Metal	Green	Positive	3.3
990	18	131	Wall 2	Support Post	Metal	Green	Positive	1.9
1017	16	133	Wall 3	Support Post	Metal	Green	Positive	4.3
1025	14	134	Wall 3	Support Post	Metal	Green	Positive	3.6
1052	10	137	Wall 3	Support Post	Metal	Green	Positive	1.5
1060	8	138	Wall 3	Support Post	Metal	Green	Positive	2.7

Confirmed Positives

Reading #	Room #	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1068	6	139	Wall 3	Support Post	Metal	Green	Positive	2
1079	4	140	Wall 3	Support Post	Metal	Green	Positive	1.6
1084	3	141	Wall 1	Support Post	Metal	Green	Positive	2.3
1092	5	142	Wall 1	Support Post	Metal	Green	Positive	2.1
1100	7	143	Wall 1	Support Post	Metal	Green	Positive	1.9
1111	9	144	Wall 1	Support Post	Metal	Green	Positive	2.2
1119	11	145	Wall 1	Support Post	Metal	Green	Positive	1.2
1127	13	146	Wall 1	Support Post	Metal	Green	Positive	2.5
1138	15	147	Wall 1	Support Post	Metal	Green	Positive	2.7
1161	C18	148	Wall 4	Fire Ext. Case	Metal	Red	Positive	1.6
1279	100A	162	Wall 2	Support Post	Metal	Green	Positive	4.2
1286	100C	163	Wall 2	Support Post	Metal	Green	Positive	4.2
1293	100E	164	Wall 2	Support Post	Metal	Green	Positive	5.7
1300	100J	165	Wall 2	Support Post	Metal	Green	Positive	5.4
1309	101	166	Wall 2	Support Post	Metal	White	Positive	6
1396	153F	178	Wall 4	Support Post	Metal	Green	Positive	4.8

XRF Results

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1	C54	1	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
2	C54	1	Wall 1	Door Casing	Wood	Green	Negative	0
3	C54	1	Wall 1	Floor	Masonry	Gray	Negative	0
4	C54	1	Wall 2	Wall	Masonry	White	Negative	0
5	C54	1	Wall 2	Support Post	Masonry	White	Negative	0
6	C54	1	Wall 2	Wall I-Beam	Metal	White	Positive	5.7
7	C54	1	Wall 3	Wall	Masonry	White	Negative	0
8	C54	1	Wall 3	Door Unit	Metal	Green	Negative	0
9	C54	1	Wall 3	Door	Metal	Green	Negative	0
10	C54	1	Wall 3	Hand Rail	Metal	Green	Negative	0.7
11	C54	1	Wall 3	Stair Tread	Masonry	Gray	Negative	0
12	C54	1	Wall 3	Stair Riser	Masonry	Gray	Negative	0
13	C54	1	Wall 4	Wall	Masonry	White	Negative	0
14	61	2	Wall 1	Wall	Masonry	White	Negative	0
15	61	2	Wall 1	Ceiling	Masonry	White	Negative	0
16	61	2	Wall 1	Door Unit	Metal	Green	Positive	1.5
17	61	2	Wall 1	Door	Metal	Green	Negative	0.1
18	61	2	Wall 2	Access Door	Metal	Green	Negative	0
19	61	2	Wall 2	Door	Metal	Green	Negative	0
20	61	2	Wall 2	Wall	Masonry	White	Negative	0
21	61	2	Wall 2	Hand Rail	Metal	Gray	Negative	0
22	61	2	Wall 2	Hand Rail	Metal	Gray	Negative	0
23	61	2	Wall 2	Hand Rail	Metal	Gray	Negative	0
24	61	2	Wall 2	Pipe	Metal	Black	Negative	0
25	61	2	Wall 3	Wall	Brick	White	Negative	0
26	61	2	Wall 3	Wall	Masonry	White	Negative	0
27	61	2	Wall 3	Access Door	Metal	Gray	Negative	0
28	61	2	Wall 3	Access Door	Metal	Gray	Negative	0
29	61	2	Wall 3	Louvre	Metal	Gray	Negative	0
30	61	2	Wall 4	Wall	Masonry	White	Negative	0
31	55A	2	Wall 4	Floor	Masonry	Gray	Negative	0
32	55A	3	Wall 1	Door Unit	Metal	Green	Negative	0
33	55A	3	Wall 1	Door	Metal	Green	Negative	0
34	55A	3	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
35	55A	3	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
36	55A	3	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
37	55A	3	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
38	55C	4	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
39	55C	4	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
40	55C	4	Wall 2	Door Unit	Metal	Green	Negative	0
41	55C	4	Wall 2	Door	Metal	Green	Negative	0
42	55C	4	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
43	55C	4	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
44	55	5	Wall 1	Wall	Masonry	White	Negative	0
45	55	5	Wall 2	Wall	Masonry	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
46	55	5	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
47	55	5	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
48	55	5	Wall 3	Door Unit	Metal	Green	Negative	0
49	55	5	Wall 4	Door Unit	Metal	Green	Negative	0
50	55	5	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
51	55B	6	Wall 1	Wall	Masonry	White	Negative	0
52	55B	6	Wall 2	Wall	Masonry	White	Negative	0
53	55B	6	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
54	55B	6	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
55	55B	6	Wall 4	Door Unit	Metal	Green	Negative	0
56	80	7	Wall 1	Support Post	Masonry	White	Negative	0
57	80	7	Wall 1	Support Post	Masonry	White	Negative	0
58	80	7	Wall 1	Support Post	Masonry	Blue	Negative	0
59	80	7	Wall 1	Support Post	Masonry	Blue	Negative	0
60	80	7	Wall 1	Wall	Masonry	White	Negative	0
61	80	7	Wall 2	Wall	Masonry	White	Negative	0
62	80	7	Wall 2	Ceiling	Masonry	Brown	Negative	0
63	57	8	Wall 1	Ceiling	Masonry	Brown	Negative	0
64	57	8	Wall 1	Wall	Masonry	Blue	Negative	0
65	57	8	Wall 1	Wall	Plaster-Gypsum	Blue	Negative	0
66	57	8	Wall 1	Baseboard	Wood	Blue	Negative	0
67	57	8	Wall 1	Door Casing	Wood	Green	Negative	0
68	57	8	Wall 1	Door Jamb/Stop	Wood	Green	Negative	0
69	57	8	Wall 2	Wall	Plaster-Gypsum	Blue	Negative	0
70	57	8	Wall 3	Wall	Plaster-Gypsum	Blue	Negative	0
71	57	8	Wall 4	Wall	Plaster-Gypsum	Blue	Negative	0
72	60	9	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
73	60	9	Wall 4	Wall	Masonry	White	Negative	0
74	60	9	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
75	60	9	Wall 2	Door Casing	Wood	Green	Negative	0
76	60	9	Wall 2	Door Jamb/Stop	Wood	Green	Negative	0
77	60	9	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
78	58	10	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
79	58	10	Wall 1	Door Casing	Wood	Green	Negative	0
80	58	10	Wall 1	Door Jamb/Stop	Wood	Green	Negative	0
81	58	10	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
82	58	10	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
83	58	10	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
84	62	11	Wall 1	Wall	Masonry	Gray	Negative	0
85	62	11	Wall 2	Door Unit	Metal	Green	Negative	0
86	62	11	Wall 2	Door	Metal	Green	Negative	0
87	62	11	Wall 2	Wall	Masonry	Brown	Negative	0
88	62	11	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
89	62	11	Wall 4	Wall	Masonry	Brown	Negative	0
90	62	11	Wall 4	Floor	Masonry	Gray	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
91	62	11	Wall 4	Support Post	Masonry	Gray	Negative	0
92	65	12	Wall 1	Support Post	Masonry	White	Negative	0
93	65	12	Wall 2	Support Post	Masonry	White	Negative	0
94	65	12	Wall 2	Wall	Masonry	White	Negative	0
95	65	12	Wall 3	Wall	Masonry	White	Negative	0
96	65	12	Wall 3	Floor	Masonry	Gray	Negative	0
97	65	12	Wall 3	Door Unit	Metal	Green	Negative	0.9
98	65	12	Wall 3	Door Unit	Metal	Green	Negative	0.9
99	65	12	Wall 3	Door Unit	Metal	Green	Positive	1.1
100	65	12	Wall 3	Door	Metal	Green	Negative	0
101	65	12	Wall 4	Wall	Masonry	Brown	Negative	0
102	69	13	Wall 1	Wall	Masonry	White	Negative	0
103	69	13	Wall 2	Wall	Masonry	White	Negative	0
104	69	13	Wall 3	Wall	Masonry	White	Negative	0
105	69	13	Wall 3	Electrical Panel	Metal	Gray	Negative	0
106	69	13	Wall 3	Ceiling	Masonry	White	Negative	0
107	69	13	Wall 3	Floor	Masonry	Gray	Negative	0
108	69	13	Wall 4	Wall	Masonry	White	Negative	0
109	69	13	Wall 4	Door Unit	Metal	Green	Negative	0
110	69	13	Wall 4	Door	Metal	Green	Negative	0
111	67	14	Wall 1	Electrical Panel	Metal	Gray	Negative	0
112	67	14	Wall 1	Electrical Panel	Metal	Gray	Negative	0
113	67	14	Wall 1	Wall	Wood	Blue	Negative	0
114	67	14	Wall 1	Wall	Masonry	White	Negative	0
115	67	14	Wall 2	Wall	Masonry	White	Negative	0
116	67	14	Wall 1	Door Unit	Metal	Green	Negative	0.6
117	67	14	Wall 1	Door Unit	Metal	Green	Negative	0.9
118	67	14	Wall 1	Door	Metal	Green	Negative	0
119	67	14	Wall 3	Wall	Masonry	White	Negative	0
120	67	14	Wall 4	Wall	Masonry	White	Negative	0
121	70	15	Wall 1	Wall	Masonry	Brown	Negative	0
122	70	15	Wall 2	Wall	Masonry	Gray	Negative	0
123	70	15	Wall 2	Door Unit	Metal	Gray	Positive	1.1
124	70	15	Wall 2	Door	Metal	Gray	Positive	7.6
125	70	15	Wall 3	Wall	Masonry	Gray	Negative	0
126	70	15	Wall 4	Wall	Masonry	Gray	Negative	0
127	71	16	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
128	71	16	Wall 2	Wall	Masonry	White	Negative	0
129	71	16	Wall 2	Heating Grate	Metal	White	Negative	0.1
130	71	16	Wall 3	Door Unit	Metal	Green	Negative	0
131	71	16	Wall 3	Wall	Masonry	White	Negative	0
132	71	16	Wall 4	Wall	Masonry	White	Negative	0
133	71	16	Wall 4	Floor	Masonry	Gray	Negative	0.1
134	72	17	Wall 1	Baseboard	Tile	Black	Negative	0
135	72	17	Wall 1	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
136	72	17	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
137	72	17	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
138	72	17	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
139	72	17	Wall 4	Door Unit	Metal	Green	Negative	0
140	72	17	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
141	73	18	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
142	73	18	Wall 1	Locker	Metal	Pink	Negative	0
143	73	18	Wall 1	Baseboard	Metal	Black	Negative	0
144	73	18	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
145	73	18	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
146	73	18	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
147	73	18	Wall 4	Duct	Metal	White	Negative	0.1
148	58	19	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
149	58	19	Wall 1	Stair Stringer	Metal	Green	Negative	0.8
150	58	19	Wall 1	Stair Stringer	Metal	Green	Negative	0.7
151	58	19	Wall 1	Stair Tread	Metal	Green	Positive	1.1
152	58	19	Wall 1	Stair Riser	Metal	Green	Positive	1.1
153	58	19	Wall 1	Hand Rail	Metal	Green	Negative	0.8
154	58	19	Wall 1	Hand Rail	Metal	Green	Negative	0.2
155	58	19	Wall 1	Hand Rail	Metal	Green	Negative	0.7
156	58	19	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
157	58	19	Wall 2	Elevator Door Casing	Metal	Green	Positive	1.6
158	58	19	Wall 2	Overhead Door	Metal	Green	Negative	0.2
159	58	19	Wall 2	Overhead Door	Metal	Green	Negative	0.2
160	58	19	Wall 2	Overhead Door	Metal	Green	Negative	0.1
161	58	19	Wall 2	Wall	Masonry	White	Negative	0.1
162	58	19	Wall 3	Wall	Masonry	White	Negative	0.1
163	58	19	Wall 4	Wall	Masonry	White	Negative	0.1
164	58	19	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
165	75	20	Wall 1	Wall	Masonry	White	Negative	0
166	75	20	Wall 1	Support Post	Masonry	White	Negative	0
167	75	20	Wall 2	Duct	Metal	White	Negative	0
168	75	20	Wall 2	Door Casing	Wood	Green	Negative	0
169	75	20	Wall 3	Wall	Masonry	White	Negative	0.1
170	75	20	Wall 4	Wall	Masonry	White	Negative	0
171	76	21	Wall 1	Wall	Masonry	Gray	Negative	0
172	76	21	Wall 1	Wall	Masonry	Brown	Negative	0
173	76	21	Wall 4	Wall	Masonry	White	Negative	0
174	C60	22	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.3
175	C60	22	Wall 2	Wall	Masonry	White	Negative	0
176	C60	22	Wall 4	Wall	Masonry	White	Negative	0
177	C60	22	Wall 3	Wall	Masonry	White	Negative	0
178	C60	22	Wall 3	Floor	Masonry	Gray	Negative	0
179	82	23	Wall 1	Floor	Masonry	Gray	Negative	0
180	82	23	Wall 1	Wall	Masonry	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
181	82	23	Wall 2	Wall	Masonry	White	Negative	0
182	82	23	Wall 2	Door Unit	Metal	Green	Positive	1.1
183	82	23	Wall 2	Door	Metal	Green	Negative	0
184	82	23	Wall 3	Wall	Wood	White	Negative	0
185	82	23	Wall 3	Wall	Masonry	White	Negative	0
186	82	23	Wall 4	Wall	Masonry	White	Negative	0
187	82	23	Wall 4	Door Unit	Metal	White	Positive	1.3
188	82	23	Wall 4	Door	Metal	White	Negative	0.3
189	83	24	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
190	83	24	Wall 2	Wall	Masonry	White	Negative	0
191	83	24	Wall 2	Wall	Masonry	White	Negative	0
192	83	24	Wall 2	Ceiling	Masonry	White	Negative	0
193	83	24	Wall 2	Door Unit	Metal	Green	Positive	1.7
194	83	24	Wall 3	Wall	Masonry	White	Negative	0.1
195	83	24	Wall 4	Wall	Masonry	White	Negative	0.1
196	83	24	Wall 4	Wall	Brick	White	Negative	0
197	C61	25	Wall 2	Wall	Masonry	White	Negative	0
198	C61	25	Wall 2	Wall	Masonry	Blue	Negative	0
199	C61	25	Wall 2	Locker	Metal	Green	Negative	0
200	C61	25	Wall 3	Door Unit	Metal	Green	Positive	1.6
201	C61	25	Wall 3	Floor	Masonry	Gray	Negative	0
202	C61	25	Wall 3	Wall	Masonry	White	Negative	0
203	C61	25	Wall 4	Wall	Masonry	White	Negative	0
204	84	26	Wall 1	Wall	Masonry	White	Negative	0.2
205	84	26	Wall 1	Wall	Brick	White	Negative	0.2
206	84	26	Wall 1	Floor	Masonry	Gray	Negative	0
207	84	26	Wall 1	Access Door	Metal	Blue	Negative	0
208	84	26	Wall 2	Stair Stringer	Metal	Green	Positive	1.2
209	84	26	Wall 2	Stair Tread	Metal	Green	Negative	0.7
210	84	26	Wall 2	Stair Tread	Metal	Green	Negative	0.8
211	84	26	Wall 2	Hand Rail	Metal	Green	Positive	1.8
212	84	26	Wall 2	Door Unit	Metal	Green	Positive	1.6
213	84	26	Wall 2	Door	Metal	Green	Negative	0
214	84	26	Wall 2	Wall	Masonry	White	Negative	0.1
215	84	26	Wall 2	Floor	Masonry	Gray	Negative	0
216	84	26	Wall 3	Wall	Masonry	White	Negative	0.1
217	84	26	Wall 4	Wall	Masonry	White	Negative	0.1
218	84	26	Wall 4	Pipe	Metal	White	Negative	0
219	85	27	Wall 1	Wall	Masonry	White	Negative	0
220	85	27	Wall 2	Wall	Masonry	White	Negative	0
221	85	27	Wall 2	Door Unit	Metal	Green	Negative	0.9
222	85	27	Wall 2	Door Unit	Metal	Green	Positive	1.2
223	85	27	Wall 2	Door	Metal	Green	Negative	0.1
224	85	27	Wall 3	Wall	Masonry	White	Negative	0
225	85	27	Wall 4	Wall	Masonry	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
226	85	27	Wall 4	Door Unit	Metal	Green	Positive	1.2
227	85	27	Wall 4	Door	Metal	Green	Negative	0
228	85	27	Wall 4	Stair Stringer	Metal	Green	Negative	0
229	85	27	Wall 4	Top Rail	Metal	Green	Negative	0
230	85	27	Wall 4	Top Rail	Metal	Green	Negative	0
231	85	27	Wall 4	Baluster	Metal	Green	Negative	0
232	85	27	Wall 3	Door Unit	Metal	Green	Negative	0
233	128	28	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
234	128	28	Wall 1	Door Casing	Wood	Unpainted	Negative	0
235	128	28	Wall 1	Baseboard	Wood	Unpainted	Negative	0
236	128	28	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
237	128	28	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
238	128	28	Wall 3	Window Unit	Metal	Green	Negative	0
239	128	28	Wall 3	Support Post	Metal	Green	Positive	3.9
240	128	28	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
241	130	29	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
242	130	29	Wall 1	Door Casing	Wood	Unpainted	Negative	0
243	130	29	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
244	130	29	Wall 3	Window Unit	Metal	Green	Negative	0
245	130	29	Wall 3	Support Post	Metal	Green	Positive	2.5
246	130	29	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
247	130	29	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
248	132	30	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
249	132	30	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
250	132	30	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
251	132	30	Wall 3	Window Unit	Metal	Green	Negative	0
252	132	30	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
253	132	30	Wall 3	Support Post	Metal	Green	Positive	3.3
254	132	30	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
255	134	31	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
256	134	31	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
257	134	31	Wall 1	Baseboard	Wood	Unpainted	Negative	0
258	134	31	Wall 1	Door Casing	Wood	Unpainted	Negative	0
259	134	31	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
260	134	31	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
261	134	31	Wall 3	Window Unit	Metal	Green	Negative	0
262	134	31	Wall 3	Support Post	Metal	Green	Positive	5.6
263	134	31	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
264	136	32	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
265	136	32	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
266	136	32	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
267	136	32	Wall 3	Window Unit	Metal	Green	Negative	0
268	136	32	Wall 3	Support Post	Metal	Green	Positive	3.8
269	136	32	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
270	138	33	Wall 1	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
271	138	33	Wall 1	Door Unit	Metal	Green	Negative	0
272	138	33	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
273	138	33	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
274	138	33	Wall 3	Window Unit	Metal	Green	Negative	0
275	138	33	Wall 3	Support Post	Metal	Green	Positive	4.4
276	138	33	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
277	138	33	Wall 1	Bar Joist	Metal	Black	Negative	0
278	138	33	Wall 1	Ceiling I-Beam	Metal	Brown	Positive	4.1
279	140	34	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
280	140	34	Wall 1	Door Unit	Metal	Green	Negative	0
281	140	34	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
282	140	34	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
283	140	34	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
284	140	34	Wall 3	Window Unit	Metal	Green	Negative	0
285	140	34	Wall 3	Support Post	Metal	Green	Positive	5.1
286	140	34	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
287	142	35	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
288	142	35	Wall 1	Baseboard	Wood	Unpainted	Negative	0
289	142	35	Wall 1	Door Casing	Wood	Unpainted	Negative	0
290	142	35	Wall 1	Door	Wood	Unpainted	Negative	0
291	142	35	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
292	142	35	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
293	142	35	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
294	142	35	Wall 3	Window Unit	Metal	Green	Negative	0
295	142	35	Wall 3	Support Post	Metal	Green	Positive	4.7
296	142	35	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
297	142	35	Wall 1	Ceiling I-Beam	Metal	Brown	Positive	3.8
298	142	35	Wall 1	Bar Joist	Metal	Black	Negative	0
299	144	36	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
300	144	36	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
301	144	36	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
302	144	36	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0
303	144	36	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
304	144	36	Wall 3	Window Unit	Metal	Green	Negative	0
305	144	36	Wall 3	Support Post	Metal	Green	Positive	4.3
306	144	36	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
307	144A	37	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
308	144A	37	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
309	144A	37	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
310	144A	37	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
311	144A	37	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
312	146A	38	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
313	146A	38	Wall 1	Door Unit	Metal	Green	Negative	0
314	146A	38	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
315	146A	38	Wall 3	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
316	146A	38	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
317	146	39	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
318	146	39	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
319	146	39	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
320	146	39	Wall 2	Unit Ventilator	Metal	Gray	Negative	0
321	146	39	Wall 2	Window Unit	Metal	Green	Negative	0
322	146	39	Wall 2	Support Post	Metal	Green	Positive	2.1
323	146	39	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
324	146	39	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
325	146	39	Wall 4	Door Casing	Wood	Unpainted	Negative	0
326	148	40	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
327	148	40	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
328	148	40	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
329	148	40	Wall 2	Unit Ventilator	Metal	Gray	Negative	0
330	148	40	Wall 2	Window Unit	Metal	Green	Negative	0
331	148	40	Wall 2	Support Post	Metal	Green	Positive	4.1
332	148	40	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
333	148	40	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
334	150	41	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
335	150	41	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
336	150	41	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
337	150	41	Wall 2	Unit Ventilator	Metal	Gray	Negative	0
338	150	41	Wall 2	Window Unit	Metal	Green	Negative	0
339	150	41	Wall 2	Support Post	Metal	Green	Positive	2.9
340	150	41	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
341	150	41	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
342	150	41	Wall 4	Door Casing	Wood	Unpainted	Negative	0
343	150A	42	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
344	150A	42	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
345	150A	42	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
346	150A	42	Wall 3	Door Unit	Metal	Green	Negative	0
347	150A	42	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
348	147A	43	Wall 1	Wall	Tile	White	Negative	0
349	147A	43	Wall 1	Wall	Tile	Brown	Negative	0
350	147A	43	Wall 1	Wall	Tile	Black	Negative	0
351	147A	43	Wall 1	Wall	Tile	Green	Negative	0
352	147A	43	Wall 2	Wall	Tile	White	Negative	0
353	147A	43	Wall 3	Wall	Tile	White	Negative	0
354	147A	43	Wall 4	Wall	Tile	White	Negative	0
355	147A	43	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
356	147A	43	Wall 2	Door Unit	Metal	Green	Negative	0
357	147	44	Wall 1	Door Unit	Metal	Green	Negative	0
358	147	44	Wall 1	Wall	Tile	White	Negative	0
359	147	44	Wall 2	Wall	Tile	White	Negative	0
360	147	44	Wall 3	Wall	Tile	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
361	147	44	Wall 4	Wall	Tile	White	Negative	0
362	147	44	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0
363	JC143	45	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.1
364	JC143	45	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
365	JC143	45	Wall 1	Wall	Tile	White	Negative	0
366	JC143	45	Wall 2	Wall	Tile	White	Negative	0
367	JC143	45	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
368	JC143	45	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
369	JC143	45	Wall 3	Door Casing	Wood	White	Negative	0
370	JC143	45	Wall 3	Door Jamb/Stop	Wood	White	Negative	0
371	JC143	45	Wall 4	Shelving	Wood	White	Negative	0
372	JC143	45	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
373	JC143	45	Wall 4	Wall	Tile	White	Negative	0
374	143	46	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
375	143	46	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
376	143	46	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
377	143	46	Wall 3	Radiator	Metal	White	Negative	0
378	143	46	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
379	143	46	Wall 1	Bar Joist	Metal	Black	Negative	0
380	143	46	Wall 1	Ceiling I-Beam	Metal	Brown	Positive	3.5
381	141	47	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
382	141	47	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
383	141	47	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
384	141	47	Wall 1	Window Unit	Metal	Green	Negative	0
385	141	47	Wall 1	Support Post	Metal	Green	Positive	1.7
386	141	47	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
387	141	47	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
388	141	47	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
389	139	48	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
390	139	48	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
391	139	48	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
392	139	48	Wall 1	Window Unit	Metal	Green	Negative	0
393	139	48	Wall 1	Support Post	Metal	Green	Positive	3.2
394	139	48	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
395	139	48	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
396	139	48	Wall 3	Baseboard	Wood	Unpainted	Negative	0
397	139	48	Wall 3	Door Casing	Wood	Unpainted	Negative	0
398	139	48	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
399	137	49	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
400	137	49	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
401	137	49	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
402	137	49	Wall 1	Window Unit	Metal	Green	Negative	0
403	137	49	Wall 1	Support Post	Metal	Green	Positive	3.5
404	137	49	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
405	137	49	Wall 3	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
406	137	49	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
407	135	50	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
408	135	50	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
409	135	50	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
410	135	50	Wall 1	Window Unit	Metal	Green	Negative	0
411	135	50	Wall 1	Support Post	Metal	Green	Positive	3.5
412	135	50	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
413	135	50	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
414	135	50	Wall 3	Baseboard	Wood	Unpainted	Negative	0
415	135	50	Wall 3	Door Casing	Wood	Unpainted	Negative	0
416	135	50	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
417	133	51	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
418	133	51	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
419	133	51	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
420	133	51	Wall 1		Metal	Green	Negative	0
421	133	51	Wall 1	Window Unit	Metal	Green	Negative	0
422	133	51	Wall 1	Support Post	Metal	Green	Positive	2.1
423	133	51	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
424	133	51	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
425	133	51	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
426	131	52	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
427	131	52	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
428	131	52	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
429	131	52	Wall 1	Window Unit	Metal	Green	Negative	0
430	131	52	Wall 1	Support Post	Metal	Green	Positive	2.9
431	131	52	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
432	131	52	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
433	131	52	Wall 3	Baseboard	Wood	Unpainted	Negative	0
434	131	52	Wall 3	Door Casing	Wood	Unpainted	Negative	0
435	131	52	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
436	C13	53	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
437	C13	53	Wall 1	Locker	Metal	Green	Negative	0
438	C13	53	Wall 1	Locker	Metal	White	Negative	0
439	C13	53	Wall 1	Heating Grate	Metal	Brown	Negative	0.2
440	C13	53	Wall 1	Water Fountain	Metal	White	Negative	0.1
441	C13	53	Wall 1	Fire Ext. Case	Metal	Red	Positive	1.2
442	C13	53	Wall 3	Wall	Tile	White	Negative	0
443	C13	53	Wall 3	Locker	Metal	Green	Negative	0
444	C13	53	Wall 3	Locker	Metal	Green	Negative	0
445	C13	53	Wall 1	Bar Joist	Metal	Brown	Negative	0
446	126	54	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
447	126	54	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
448	126	54	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
449	126	54	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
450	126	54	Wall 4	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
451	127	55	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
452	127	55	Wall 1	Wall	Wood	Gray	Negative	0
453	127	55	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
454	127	55	Wall 2	Door Unit	Metal	Green	Negative	0
455	127	55	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
456	127	55	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
457	124A	56	Wall 1	Wall	Tile	White	Negative	0
458	124A	56	Wall 1	Door Unit	Metal	Green	Negative	0
459	124A	56	Wall 2	Wall	Tile	White	Negative	0
460	124A	56	Wall 3	Wall	Tile	White	Negative	0
461	124A	56	Wall 4	Wall	Tile	White	Negative	0
462	124A	56	Wall 1	Bar Joist	Metal	Brown	Negative	0
463	124A	56	Wall 1	Ceiling I-Beam	Metal	Orange	Positive	5.1
464	124	57	Wall 1	Wall	Tile	White	Negative	0
465	124	57	Wall 2	Wall	Tile	White	Negative	0
466	124	57	Wall 3	Wall	Tile	White	Negative	0
467	124	57	Wall 3	Door Unit	Metal	Green	Negative	0
468	124	57	Wall 4	Wall	Tile	White	Negative	0
469	123	58	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
470	123	58	Wall 1	Door Unit	Metal	Green	Negative	0
471	123	58	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
472	123	58	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
473	123	58	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
474	122	59	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
475	122	59	Wall 1	Window Unit	Metal	Green	Negative	0
476	122	59	Wall 2	Stair Stringer	Metal	Green	Negative	0.8
477	122	59	Wall 2	Stair Stringer	Metal	Green	Positive	1.6
478	122	59	Wall 2	Hand Rail	Metal	Green	Negative	0
479	122	59	Wall 2	Door Casing	Wood	Green	Negative	0
480	122	59	Wall 2	Door Casing	Wood	Green	Negative	0
481	122	59	Wall 2	Wall	Masonry	White	Negative	0
482	122	59	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
483	122	59	Wall 3	Unit Ventilator	Metal	White	Negative	0
484	122	59	Wall 3	Window Unit	Metal	Green	Negative	0
485	122	59	Wall 3	Door Unit	Metal	Green	Negative	0
486	122	59	Wall 3	Door	Metal	Green	Negative	0
487	122	59	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
488	C10A	60	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
489	C10A	60	Wall 1	Wall	Masonry	White	Negative	0.6
490	C10A	60	Wall 1	Wall	Masonry	White	Negative	0.2
491	C10A	60	Wall 1	Hand Rail	Metal	Green	Negative	0
492	C10A	60	Wall 1	Stair Stringer	Metal	Green	Negative	0
493	C10A	60	Wall 1	Stair Stringer	Metal	Green	Negative	0
494	C10A	60	Wall 1	Hand Rail	Metal	Green	Negative	0
495	C10A	60	Wall 1	Hand Rail	Metal	Green	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
496	C10A	60	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
497	C10A	60	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
498	C10A	60	Wall 4	Wall	Masonry	White	Negative	0
499	121	61	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
500	121	61	Wall 1	Door Unit	Metal	Green	Negative	0
501	121	61	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
502	121	61	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
503	121	61	Wall 3	Unit Ventilator	Metal	White	Negative	0
504	121	61	Wall 3	Window Unit	Metal	Green	Negative	0
505	121	61	Wall 4	Wall	Masonry	White	Negative	0
506	121	61	Wall 4	Ceiling I-Beam	Metal	White	Positive	5.4
507	121	61	Wall 4	Structural Steel	Metal	White	Negative	0
508	118D	62	Wall 1	Wall	Masonry	White	Negative	0
509	118D	62	Wall 2	Wall	Masonry	White	Negative	0
510	118D	62	Wall 2	Door Unit	Metal	Green	Negative	0
511	118D	62	Wall 2	Ceiling	Masonry	White	Negative	0
512	118D	62	Wall 3	Wall	Masonry	White	Negative	0
513	118D	62	Wall 4	Wall	Masonry	White	Negative	0
514	118D	62	Wall 4	Baseboard	Wood	Green	Negative	0
515	118	63	Wall 1	Baseboard	Metal	Green	Negative	0.5
516	118	63	Wall 1	Hand Rail	Metal	Green	Negative	0
517	118	63	Wall 1	Stair Stringer	Metal	Green	Negative	0
518	118	63	Wall 2	Ladder	Metal	Green	Negative	0.8
519	118	63	Wall 2	Door Unit	Metal	Green	Negative	0
520	118	63	Wall 2	Wall	Masonry	White	Negative	0
521	118	63	Wall 3	Wall	Masonry	White	Negative	0
522	118	63	Wall 3	Unit Ventilator	Metal	White	Negative	0
523	118	63	Wall 3	Window Unit	Metal	Green	Negative	0
524	118	63	Wall 3	Door Unit	Metal	Green	Negative	0
525	118	63	Wall 3	Door	Metal	Green	Negative	0.4
526	118	63	Wall 3	Support Post	Metal	Green	Positive	4.7
527	118	63	Wall 3	Support Post	Metal	Green	Positive	6.7
528	118	63	Wall 4	Wall	Masonry	White	Negative	0
529	118	63	Wall 4	Structural Steel	Metal	White	Negative	0.2
530	118	63	Wall 4	Structural Steel	Metal	White	Negative	0.2
531	118	63	Wall 4	Duct	Metal	White	Negative	0
532	118	63	Wall 4	Ceiling I-Beam	Metal	White	Positive	5.7
533	118A	64	Wall 1	Wall	Masonry	White	Negative	0
534	118A	64	Wall 1	Wall I-Beam	Metal	White	Positive	5.9
535	118A	64	Wall 2	Door Unit	Metal	Green	Negative	0
536	118A	64	Wall 2	Window Unit	Metal	Green	Negative	0
537	118A	64	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
538	118A	64	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
539	118A	64	Wall 4	Wall	Masonry	White	Negative	0
540	118A	64	Wall 4	Unit Ventilator	Metal	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
541	115	65	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
542	115	65	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
543	115	65	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
544	115	65	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
545	115	65	Wall 3	Door Unit	Metal	Green	Negative	0
546	115	65	Wall 4	Unit Ventilator	Metal	Gray	Negative	0
547	115	65	Wall 4	Window Unit	Metal	Green	Negative	0
548	115	65	Wall 4	Support Post	Metal	Green	Positive	4.6
549	115	65	Wall 1	Bar Joist	Metal	White	Negative	0
550	115	65	Wall 1	Ceiling I-Beam	Metal	White	Positive	3.7
551	117	66	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
552	117	66	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
553	117	66	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
554	117	66	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
555	117	66	Wall 4	Unit Ventilator	Metal	Gray	Negative	0
556	117	66	Wall 4	Window Unit	Metal	Green	Negative	0
557	117	66	Wall 4	Support Post	Metal	Green	Positive	6.4
558	117	66	Wall 1	Ceiling I-Beam	Metal	White	Positive	3.9
559	117	66	Wall 1	Bar Joist	Metal	White	Negative	0.1
560	117D	67	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
561	117D	67	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
562	117D	67	Wall 1	Unit Ventilator	Metal	White	Negative	0
563	117D	67	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
564	117D	67	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
565	117D	67	Wall 3	Heating Grate	Metal	White	Negative	0
566	117D	67	Wall 3	Door Casing	Wood	White	Negative	0
567	117D	67	Wall 4	Window Unit	Metal	White	Negative	0
568	117F	68	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
569	117F	68	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
570	117F	68	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
571	117F	68	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
572	117F	68	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
573	117F	68	Wall 4	Door Casing	Wood	White	Negative	0
574	117C	69	Wall 1	Door Casing	Wood	White	Negative	0.1
575	117C	69	Wall 1	Baseboard	Wood	White	Negative	0
576	117C	69	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
577	117C	69	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
578	117C	69	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
579	117C	69	Wall 4	Unit Ventilator	Metal	White	Negative	0
580	117C	69	Wall 4	Window Unit	Metal	Green	Negative	0
581	117C	69	Wall 4	Support Post	Metal	Green	Positive	6.3
582	117A	70	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0
583	117A	70	Wall 1	Baseboard	Wood	White	Negative	0
584	117A	70	Wall 1	Door Casing	Wood	White	Negative	0
585	117A	70	Wall 2	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
586	117A	70	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
587	117A	70	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
588	114B	71	Wall 1	Wall	Masonry	White	Negative	0
589	114B	71	Wall 2	Wall	Masonry	White	Negative	0
590	114B	71	Wall 3	Wall	Masonry	White	Negative	0
591	114B	71	Wall 3	Door Casing	Wood	White	Negative	0
592	114B	71	Wall 4	Wall	Masonry	White	Negative	0
593	114D	72	Wall 1	Door Unit	Metal	Green	Negative	0
594	114D	72	Wall 1	Door	Metal	Green	Negative	0.4
595	114D	72	Wall 2	Heating Grate	Metal	White	Negative	0
596	114D	72	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
597	114D	72	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
598	114D	72	Wall 3	Door Unit	Metal	Green	Negative	0.1
599	114D	72	Wall 4	Unit Ventilator	Metal	White	Negative	0
600	114D	72	Wall 4	Wall	Masonry	White	Negative	0
601	114	73	Wall 1	Wall	Masonry	White	Negative	0
602	114	73	Wall 3	Wall	Masonry	White	Negative	0
603	114	73	Wall 4	Wall	Masonry	Black	Negative	0
604	114	73	Wall 4	Door Casing	Wood	Black	Negative	0
605	114	73	Wall 4	Wall I-Beam	Metal	Black	Positive	5.4
606	113	74	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
607	113	74	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
608	113	74	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
609	113	74	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
610	C6	75	Wall 1	Window Unit	Metal	Green	Negative	0
611	C6	75	Wall 1	Door Unit	Metal	Green	Negative	0
612	C6	75	Wall 1	Door	Metal	Green	Negative	0
613	C6	75	Wall 2	Door Unit	Metal	Green	Negative	0
614	C6	75	Wall 2	Wall	Tile	Blue	Negative	0
615	C6	75	Wall 2	Wall	Tile	White	Negative	0
616	C6	75	Wall 2	Window Unit	Metal	Green	Negative	0
617	C6	75	Wall 2	Door Unit	Metal	Green	Negative	0
618	C6	75	Wall 2	Door	Metal	Green	Negative	0
619	C6	75	Wall 2	Support Post	Metal	Green	Positive	8
620	C6	75	Wall 4	Unit Ventilator	Metal	White	Negative	0
621	C6	75	Wall 3	Wall	Tile	White	Negative	0
622	C6	75	Wall 3	Bar Joist	Metal	Black	Negative	0
623	C6	75	Wall 3	Ceiling I-Beam	Metal	Brown	Negative	0
624	C6	75	Wall 3	Ceiling I-Beam	Metal	Brown	Negative	0
625	C7	76	Wall 1	Locker	Metal	Green	Negative	0.1
626	C7	76	Wall 1	Locker	Metal	Green	Negative	0
627	C7	76	Wall 1	Wall	Tile	White	Negative	0
628	C7	76	Wall 3	Wall	Tile	White	Negative	0
629	C7	76	Wall 3	Door Unit	Metal	Green	Negative	0
630	C7	76	Wall 1	Fire Ext. Case	Metal	Red	Negative	0.9

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
631	C7	76	Wall 1	Fire Ext. Case	Metal	Red	Positive	1.1
632	C7	76	Wall 1	Ceiling I-Beam	Metal	Brown	Negative	0
633	C7	76	Wall 1	Bar Joist	Metal	Black	Negative	0
634	111	77	Wall 1	Wall	Tile	Intact	Negative	0
635	111	77	Wall 1	Window Unit	Metal	Intact	Negative	0
636	111	77	Wall 1	Support Post	Metal	Intact	Positive	3.7
637	111	77	Wall 2	Ceiling	Plaster-Gypsum	Intact	Negative	0
638	111	77	Wall 2	Wall	Tile	Intact	Negative	0
639	111	77	Wall 2	Door Unit	Metal	Intact	Negative	0
640	111	77	Wall 3	Door Unit	Metal	Intact	Negative	0
641	111	77	Wall 3	Wall	Tile	Intact	Negative	0
642	111	77	Wall 4	Wall	Tile	Intact	Negative	0
643	110	78	Wall 1	Wall	Tile	Intact	Negative	0
644	110	78	Wall 2	Wall	Tile	Intact	Negative	0
645	110	78	Wall 2	Door Unit	Metal	Intact	Negative	0
646	110	78	Wall 3	Wall	Tile	Intact	Negative	0
647	110	78	Wall 4	Wall	Tile	Intact	Negative	0
648	110	78	Wall 1	Bar Joist	Metal	Intact	Negative	0
649	108	79	Wall 1	Window Unit	Metal	Intact	Negative	0
650	108	79	Wall 1	Support Post	Metal	Intact	Positive	5.5
651	108	79	Wall 1	Door Unit	Metal	Intact	Negative	0
652	108	79	Wall 1	Door	Metal	Intact	Negative	0
653	108	79	Wall 1	Wall	Tile	Intact	Negative	0
654	108	79	Wall 1	Ceiling	Plaster-Gypsum	Intact	Negative	0
655	108	79	Wall 2	Wall	Tile	Intact	Negative	0
656	108	79	Wall 3	Wall	Tile	Intact	Negative	0
657	108	79	Wall 4	Wall	Tile	Intact	Negative	0
658	C4	80	Wall 1	Wall	Tile	Intact	Negative	0
659	C4	80	Wall 1	Door Unit	Metal	Intact	Negative	0
660	C4	80	Wall 1	Fire Ext. Case	Metal	Intact	Negative	0
661	C4	80	Wall 3	Unit Ventilator	Metal	Intact	Negative	0
662	C4	80	Wall 3	Window Unit	Metal	Intact	Negative	0
663	C4	80	Wall 3	Support Post	Metal	Intact	Positive	4.7
664	C4	80	Wall 3	Wall	Tile	Intact	Negative	0
665	C4	80	Wall 3	Ceiling I-Beam	Metal	Intact	Positive	5
666	C4	80	Wall 3	Bar Joist	Metal	Intact	Negative	0
667	152	81	Wall 1	Wall	Plaster-Gypsum	Intact	Negative	0
668	152	81	Wall 2	Wall	Plaster-Gypsum	Intact	Negative	0
669	152	81	Wall 3	Wall	Plaster-Gypsum	Intact	Negative	0
670	152	81	Wall 4	Wall	Plaster-Gypsum	Intact	Negative	0
671	152	81	Wall 4	Door Unit	Metal	Intact	Negative	0
672	152	81	Wall 4	Bar Joist	Metal	Intact	Negative	0
673	152	81	Wall 4	Ceiling I-Beam	Metal	Intact	Positive	4.1
674	151	82	Wall 1	Wall	Plaster-Gypsum	Intact	Negative	0
675	151	82	Wall 2	Wall	Plaster-Gypsum	Intact	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
676	151	82	Wall 3	Wall	Plaster-Gypsum	Intact	Negative	0
677	151	82	Wall 3	Wall I-Beam	Metal	Intact	Positive	5.4
678	151	82	Wall 4	Wall	Plaster-Gypsum	Intact	Negative	0
679	201	101	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
680	201	101	Wall 1	Baseboard	Wood	Green	Negative	0.1
681	201	101	Wall 1	Shelving	Wood	White	Negative	0
682	201	101	Wall 2	Wall Molding	Wood	White	Negative	0.1
683	201	101	Wall 2	Door Casing	Wood	White	Negative	0
684	201	101	Wall 2	Door	Wood	Unpainted	Negative	0
685	201	101	Wall 3	Floor	Wood	Black	Negative	0
686	201	101	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.4
687	201	101	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
688	201	101	Wall 4	Ladder	Metal	Green	Negative	0.5
689	201	101	Wall 4	Ladder	Metal	Green	Negative	0
690	201	101	Wall 4	Roof Access	Metal	Green	Positive	1.5
691	201	101	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
692	202B	102	Wall 1	Wall	Tile	White	Negative	0.2
693	202B	102	Wall 1	Wall	Tile	Black	Negative	0.1
694	202B	102	Wall 1	Wall	Tile	Brown	Negative	0.2
695	202B	102	Wall 1	Baseboard	Tile	Black	Negative	0.4
696	202B	102	Wall 1	Baseboard	Tile	Black	Negative	0.2
697	202B	102	Wall 1	Baseboard	Tile	Brown	Negative	0.3
698	202B	102	Wall 2	Wall	Tile	White	Negative	0.2
699	202B	102	Wall 3	Wall	Tile	White	Negative	0.3
700	202B	102	Wall 3	Door Unit	Metal	Green	Negative	0
701	202B	102	Wall 4	Wall	Tile	White	Negative	0.3
702	202B	102	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0.3
703	202B	102	Wall 4	Floor	Tile	White	Negative	0.1
704	202	103	Wall 1	Door Unit	Metal	Green	Negative	0
705	202	103	Wall 1	Wall	Tile	Green	Negative	0.3
706	202	103	Wall 1	Wall	Tile	Brown	Negative	0.3
707	202	103	Wall 1	Wall	Tile	Black	Negative	0.2
708	202	103	Wall 1	Wall	Tile	White	Negative	0.1
709	202	103	Wall 2	Wall	Tile	White	Negative	0.1
710	202	103	Wall 2	Stall	Vinyl	Black	Negative	0
711	202	103	Wall 3	Floor	Tile	White	Negative	0
712	202	103	Wall 3	Wall	Tile	White	Negative	0
713	202	103	Wall 4	Wall	Tile	White	Negative	0.3
714	202	103	Wall 1	Baseboard	Tile	Black	Negative	0.4
715	202	103	Wall 1	Baseboard	Tile	Brown	Negative	0.3
716	202C	104	Wall 1	Baseboard	Tile	Brown	Negative	0.4
717	202C	104	Wall 1	Baseboard	Tile	Black	Negative	0.4
718	202C	104	Wall 1	Wall	Tile	White	Negative	0.3
719	202C	104	Wall 1	Wall	Tile	Black	Negative	0.4
720	202C	104	Wall 1	Wall	Tile	Brown	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
721	202C	104	Wall 1	Wall	Tile	White	Negative	0.3
722	202C	104	Wall 2	Wall	Tile	White	Negative	0.2
723	202C	104	Wall 3	Wall	Tile	White	Negative	0.1
724	202C	104	Wall 4	Wall	Tile	White	Negative	0.2
725	202C	104	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0.4
726	202C	104	Wall 4	Door Unit	Metal	Green	Negative	0
727	202A	105	Wall 1	Baseboard	Tile	Black	Negative	0
728	202A	105	Wall 1	Baseboard	Tile	Brown	Negative	0.1
729	202A	105	Wall 1	Wall	Tile	Brown	Negative	0
730	202A	105	Wall 1	Wall	Tile	Green	Negative	0.4
731	202A	105	Wall 1	Wall	Tile	Black	Negative	0
732	202A	105	Wall 1	Wall	Tile	White	Negative	0
733	202A	105	Wall 2	Stall	Vinyl	Black	Negative	0
734	202A	105	Wall 2	Floor	Tile	White	Negative	0
735	202A	105	Wall 2	Wall	Tile	White	Negative	0.2
736	202A	105	Wall 3	Wall	Tile	White	Negative	0
737	202A	105	Wall 4	Wall	Tile	White	Negative	0.3
738	203	106	Wall 3	Baseboard	Wood	Unpainted	Negative	0
739	203	106	Wall 3	Door Casing	Wood	Unpainted	Negative	0
740	203	106	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
741	203	106	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
742	203	106	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
743	203	106	Wall 1	Window Unit	Metal	Green	Negative	0.2
744	203	106	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
745	203	106	Wall 1	Support Post	Metal	Green	Positive	2.7
746	203	106	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.2
747	205	107	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.3
748	205	107	Wall 3	Door Casing	Wood	Unpainted	Negative	0
749	205	107	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
750	205	107	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
751	205	107	Wall 1	Window Unit	Metal	Green	Negative	0
752	205	107	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
753	205	107	Wall 1	Support Post	Metal	Green	Positive	2.4
754	205	107	Wall 2	Wall	Metal	White	Negative	0.2
755	207	108	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
756	207	108	Wall 1	Window Unit	Metal	Green	Negative	0
757	207	108	Wall 1	Unit Ventilator	Metal	Green	Negative	0.1
758	207	108	Wall 1	Support Post	Metal	Green	Positive	1.6
759	207	108	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
760	207	108	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
761	207	108	Wall 3	Baseboard	Wood	Unpainted	Negative	0
762	207	108	Wall 3	Door Casing	Wood	Unpainted	Negative	0
763	207	108	Wall 3	Door	Wood	Unpainted	Negative	0
764	207	108	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
765	209	109	Wall 1	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
766	209	109	Wall 1	Window Unit	Metal	Green	Negative	0
767	209	109	Wall 1	Unit Ventilator	Metal	Green	Negative	0.2
768	209	109	Wall 1	Support Post	Metal	Green	Positive	1.3
769	209	109	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
770	209	109	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
771	209	109	Wall 3	Door Casing	Wood	Unpainted	Negative	0
772	209	109	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.3
773	211	110	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
774	211	110	Wall 1	Window Unit	Metal	Green	Negative	0
775	211	110	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
776	211	110	Wall 1	Support Post	Metal	Green	Positive	3.1
777	211	110	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.2
778	211	110	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
779	211	110	Wall 3	Door Casing	Wood	Unpainted	Negative	0
780	211	110	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
781	213	111	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
782	213	111	Wall 1	Window Unit	Metal	Green	Negative	0.1
783	213	111	Wall 1	Support Post	Metal	Green	Positive	3.9
784	213	111	Wall 1	Unit Ventilator	Metal	Gray	Negative	0
785	213	111	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
786	213	111	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
787	213	111	Wall 3	Baseboard	Wood	Unpainted	Negative	0
788	213	111	Wall 3	Door Casing	Wood	Unpainted	Negative	0
789	213	111	Wall 3	Door	Wood	Unpainted	Negative	0
790	213	111	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
791	215	112	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
792	215	112	Wall 1	Window Unit	Metal	Green	Negative	0.2
793	215	112	Wall 1	Support Post	Metal	Green	Positive	4.8
794	215	112	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.1
795	215	112	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
796	215	112	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
797	215	112	Wall 3	Door Casing	Wood	Unpainted	Negative	0
798	215	112	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
799	217	113	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
800	217	113	Wall 1	Fire Ext. Case	Metal	Red	Negative	0
801	217	113	Wall 2	Window Unit	Metal	Green	Negative	0.2
802	217	113	Wall 2	Support Post	Metal	Green	Positive	3.7
803	217	113	Wall 2	Unit Ventilator	Metal	Black	Negative	0
804	217	113	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
805	217	113	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
806	217	113	Wall 3	Baseboard	Wood	Unpainted	Negative	0
807	217	113	Wall 3	Door Unit	Metal	Green	Negative	0
808	217	113	Wall 4	Door Casing	Wood	Unpainted	Negative	0.1
809	217	113	Wall 4	Door	Wood	Unpainted	Negative	0
810	217	113	Wall 4	Wall	Plaster-Gypsum	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
811	218A	114	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
812	218A	114	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
813	218A	114	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
814	218A	114	Wall 3	Door Unit	Metal	Green	Negative	0
815	218A	114	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
816	218	115	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
817	218	115	Wall 1	Door Unit	Metal	Green	Negative	0
818	218	115	Wall 2	Window Unit	Metal	Green	Negative	0
819	218	115	Wall 2	Support Post	Metal	Green	Positive	2.9
820	218	115	Wall 2	Unit Ventilator	Metal	Gray	Negative	0.2
821	218	115	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
822	218	115	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
823	218	115	Wall 3	Baseboard	Wood	Unpainted	Negative	0.1
824	218	115	Wall 4	Door Casing	Wood	Unpainted	Negative	0
825	218	115	Wall 4	Door	Wood	Unpainted	Negative	0
826	218	115	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
827	220	116	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
828	220	116	Wall 1	Wall	Tile	White	Negative	0.1
829	220	116	Wall 1	Door Unit	Metal	Green	Negative	0
830	220	116	Wall 2	Wall	Tile	White	Negative	0
831	220	116	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
832	220	116	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
833	220	116	Wall 3	Wall	Tile	White	Negative	0
834	220	116	Wall 3	Unit Ventilator	Metal	White	Negative	0
835	220	116	Wall 4	Wall	Tile	White	Negative	0
836	220	116	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
837	220	116	Wall 1	Access Door	Metal	White	Negative	0
838	216	117	Wall 1	Door Casing	Wood	Unpainted	Negative	0
839	216	117	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.3
840	216	117	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
841	216	117	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
842	216	117	Wall 3	Window Unit	Metal	Green	Negative	0
843	216	117	Wall 3	Support Post	Metal	Green	Positive	4.4
844	216	117	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
845	216	117	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
846	214	118	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.2
847	214	118	Wall 1	Door Casing	Wood	Unpainted	Negative	0
848	214	118	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
849	214	118	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
850	214	118	Wall 3	Window Unit	Metal	Green	Negative	0
851	214	118	Wall 3	Support Post	Metal	Green	Positive	2.8
852	214	118	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
853	214	118	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
854	212	119	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
855	212	119	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
856	212	119	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
857	212	119	Wall 4	Door Unit	Metal	Green	Negative	0
858	212	119	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
859	221	120	Wall 1	Wall	Tile	White	Negative	0
860	221	120	Wall 1	Wall	Tile	Black	Negative	0
861	221	120	Wall 1	Wall	Tile	Brown	Negative	0.1
862	221	120	Wall 1	Wall	Tile	Green	Negative	0
863	221	120	Wall 1	Baseboard	Tile	Brown	Negative	0.2
864	221	120	Wall 1	Baseboard	Tile	Black	Negative	0.1
865	221	120	Wall 1	Floor	Tile	White	Negative	0
866	221	120	Wall 2	Stall	Vinyl	Black	Negative	0.2
867	221	120	Wall 2	Wall	Tile	White	Negative	0
868	221	120	Wall 3	Wall	Tile	White	Negative	0
869	221	120	Wall 4	Door Unit	Metal	Green	Negative	0
870	221	120	Wall 4	Wall	Tile	White	Negative	0.1
871	210	121	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.2
872	210	121	Wall 1	Baseboard	Wood	Unpainted	Negative	0
873	210	121	Wall 1	Door Casing	Wood	Unpainted	Negative	0
874	210	121	Wall 1	Door	Wood	Unpainted	Negative	0
875	210	121	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.2
876	210	121	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
877	210	121	Wall 3	Window Unit	Metal	Green	Negative	0
878	210	121	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
879	210	121	Wall 3	Support Post	Metal	White	Positive	2.9
880	210	121	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
881	208	122	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
882	208	122	Wall 1	Door Casing	Wood	Unpainted	Negative	0
883	208	122	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
884	208	122	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
885	208	122	Wall 3	Window Unit	Metal	Green	Negative	0.1
886	208	122	Wall 3	Support Post	Metal	Green	Positive	5.1
887	208	122	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
888	208	122	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
889	206	123	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
890	206	123	Wall 1	Door Casing	Wood	Unpainted	Negative	0
891	206	123	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
892	206	123	Wall 3	Wall	Metal	Green	Negative	0
893	206	123	Wall 3	Window Unit	Metal	Green	Negative	0.1
894	206	123	Wall 3	Support Post	Metal	Green	Positive	1
895	206	123	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
896	206	123	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
897	204	124	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
898	204	124	Wall 1	Baseboard	Wood	Unpainted	Negative	0
899	204	124	Wall 1	Door Casing	Wood	Unpainted	Negative	0
900	204	124	Wall 1	Door	Wood	Unpainted	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
901	204	124	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
902	204	124	Wall 3	Wall	Metal	Green	Negative	0.1
903	204	124	Wall 3	Window Unit	Metal	Green	Negative	0.1
904	204	124	Wall 3	Support Post	Metal	Green	Positive	1.8
905	204	124	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
906	204	124	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
907	C46	125	Wall 1	Ceiling I-Beam	Metal	Intact	Positive	2.6
908	C46	125	Wall 1	Bar Joist	Metal	Intact	Negative	0
909	C46	125	Wall 1	Wall	Tile	White	Negative	0.2
910	C46	125	Wall 1	Wall	Tile	Black	Negative	0
911	C46	125	Wall 1	Wall	Tile	Brown	Negative	0
912	C46	125	Wall 1	Wall	Tile	Green	Negative	0.2
913	C46	125	Wall 1	Locker	Metal	Green	Negative	0
914	C46	125	Wall 1	Locker	Metal	Green	Negative	0.1
915	C46	125	Wall 1	Locker	Metal	Green	Negative	0
916	C46	125	Wall 1	Locker	Metal	Brown	Negative	0
917	C46	125	Wall 1	Locker	Metal	Brown	Negative	0
918	C46	125	Wall 1	Locker	Metal	Brown	Negative	0
919	C46	125	Wall 1	Door Casing	Wood	Unpainted	Negative	0
920	C46	125	Wall 1	Door Unit	Metal	Green	Negative	0
921	C46	125	Wall 2	Wall	Tile	White	Negative	0
922	C46	125	Wall 3	Wall	Tile	White	Negative	0.4
923	C46	125	Wall 4	Wall	Tile	White	Negative	0.1
924	C46	125	Wall 4	Fire Ext. Case	Metal	Red	Negative	0.9
925	C46	125	Wall 4	Fire Ext. Case	Metal	Red	Positive	1.1
926	C46	125	Wall 3	Locker	Metal	Green	Negative	0
927	C46	125	Wall 3	Locker	Metal	Brown	Negative	0
928	C46	125	Wall 4	Door Unit	Metal	Green	Negative	0
929	C45	126	Wall 2	Fire Ext. Case	Metal	Gray	Negative	0.1
930	C45	126	Wall 2	Door Unit	Metal	Green	Negative	0
931	C45	126	Wall 2	Wall	Tile	Green	Negative	0.3
932	C45	126	Wall 2	Wall	Tile	Brown	Negative	0.1
933	C45	126	Wall 2	Wall	Tile	Black	Negative	0.1
934	C45	126	Wall 2	Wall	Tile	White	Negative	0.3
935	C45	126	Wall 3	Wall	Tile	White	Negative	0.3
936	C45	126	Wall 4	Wall	Tile	White	Negative	0.2
937	S5	127	Wall 1	Wall	Tile	White	Negative	0
938	S5	127	Wall 1	Wall	Tile	Black	Negative	0
939	S5	127	Wall 1	Wall	Tile	Brown	Negative	0
940	S5	127	Wall 1	Wall	Tile	Green	Negative	0.1
941	S5	127	Wall 2	Wall	Tile	White	Negative	0
942	S5	127	Wall 2	Door Unit	Metal	Green	Negative	0.1
943	S5	127	Wall 2	Window Unit	Metal	Green	Negative	0
944	S5	127	Wall 3	Door Unit	Metal	Green	Negative	0
945	S5	127	Wall 3	Wall	Tile	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
946	S5	127	Wall 4	Wall	Tile	White	Negative	0.1
947	S5	127	Wall 4	Unit Ventilator	Metal	White	Negative	0
948	S5	127	Wall 4	Hand Rail	Metal	Green	Positive	1.1
949	S5	127	Wall 4	Hand Rail	Metal	Green	Positive	1.2
950	S5	127	Wall 4	Top Rail	Metal	Green	Positive	1
951	S5	127	Wall 4	Baluster	Metal	Green	Negative	0
952	S5	127	Wall 4	Baluster	Metal	Green	Negative	0
953	S5	127	Wall 4	Newel Post	Metal	Green	Negative	0.9
954	S5	127	Wall 4	Newel Post	Metal	Green	Positive	1
955	S4	128	Wall 1	Bar Joist	Metal	Intact	Negative	0
956	S4	128	Wall 1	Ceiling I-Beam	Metal	Intact	Positive	3.4
957	S4	128	Wall 1	Wall	Tile	White	Negative	0
958	S4	128	Wall 1	Door Unit	Metal	Green	Negative	0.2
959	S4	128	Wall 1	Window Unit	Metal	Green	Negative	0
960	S4	128	Wall 2	Wall	Tile	Green	Negative	0
961	S4	128	Wall 2	Wall	Tile	Brown	Negative	0
962	S4	128	Wall 2	Wall	Tile	Black	Negative	0
963	S4	128	Wall 2	Wall	Tile	White	Negative	0
964	S4	128	Wall 3	Hand Rail	Metal	Green	Negative	0.6
965	S4	128	Wall 3	Hand Rail	Metal	Green	Negative	0
966	S4	128	Wall 3	Hand Rail	Metal	Green	Positive	1
967	S4	128	Wall 3	Hand Rail	Metal	Green	Negative	0
968	S4	128	Wall 3	Hand Rail	Metal	Green	Negative	0
969	S4	128	Wall 3	Top Rail	Metal	Green	Negative	0.5
970	S4	128	Wall 3	Top Rail	Metal	Green	Negative	0.8
971	S4	128	Wall 3	Top Rail	Metal	Green	Negative	0.8
972	17	129	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
973	17	129	Wall 2	Wall	Metal	Green	Negative	0.1
974	17	129	Wall 2	Window Unit	Metal	Green	Negative	0.1
975	17	129	Wall 2	Support Post	Metal	Green	Positive	3.3
976	17	129	Wall 2	Unit Ventilator	Metal	Gray	Negative	0.2
977	17	129	Wall 3	Door Unit	Metal	Green	Negative	0
978	17	129	Wall 3	Baseboard	Wood	Unpainted	Negative	0.1
979	17	129	Wall 4	Door Casing	Wood	Unpainted	Negative	0.1
980	17	129	Wall 4	Door	Wood	Unpainted	Negative	0
981	17	129	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.4
982	18A	130	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
983	18A	130	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
984	18A	130	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
985	18A	130	Wall 3	Door Unit	Metal	Green	Negative	0
986	18A	130	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
987	18	131	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.3
988	18	131	Wall 1	Door Unit	Metal	Green	Negative	0.1
989	18	131	Wall 2	Window Unit	Metal	Green	Negative	0
990	18	131	Wall 2	Support Post	Metal	Green	Positive	1.9

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
991	18	131	Wall 2	Wall	Metal	Green	Negative	0.1
992	18	131	Wall 2	Heating Grate	Metal	Gray	Negative	0.2
993	18	131	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
994	18	131	Wall 4	Door Casing	Wood	Unpainted	Negative	0.1
995	18	131	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
996	20	132	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
997	20	132	Wall 1	Wall	Tile	White	Negative	0.2
998	20	132	Wall 1	Door Unit	Metal	Green	Negative	0
999	20	132	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
1000	20	132	Wall 1	Wall	Tile	White	Negative	0
1001	20	132	Wall 2	Wall	Tile	White	Negative	0
1002	20	132	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1003	20	132	Wall 2	Wall	Tile	White	Negative	0
1004	20	132	Wall 3	Wall	Tile	White	Negative	0.1
1005	20	132	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
1006	20	132	Wall 3	Unit Ventilator	Metal	White	Negative	0
1007	20	132	Wall 3	Shutter	Wood	White	Negative	0
1008	20	132	Wall 4	Wall	Tile	White	Negative	0
1009	20	132	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1010	16	133	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
1011	16	133	Wall 1	Baseboard	Wood	Unpainted	Negative	0.2
1012	16	133	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1013	16	133	Wall 1	Door	Wood	Unpainted	Negative	0
1014	16	133	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1015	16	133	Wall 3	Wall	Metal	Green	Negative	0.1
1016	16	133	Wall 3	Window Unit	Metal	Green	Negative	0.1
1017	16	133	Wall 3	Support Post	Metal	Green	Positive	4.3
1018	16	133	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
1019	16	133	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1020	14	134	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
1021	14	134	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1022	14	134	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1023	14	134	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.3
1024	14	134	Wall 3	Window Unit	Metal	Green	Negative	0.2
1025	14	134	Wall 3	Support Post	Metal	Green	Positive	3.6
1026	14	134	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
1027	14	134	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1028	12	135	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1029	12	135	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1030	12	135	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1031	12	135	Wall 4	Door Unit	Metal	Green	Negative	0
1032	12	135	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1033	21	136	Wall 1	Wall	Tile	White	Negative	0.2
1034	21	136	Wall 1	Wall	Tile	Green	Negative	0.3
1035	21	136	Wall 1	Wall	Tile	Brown	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1036	21	136	Wall 1	Baseboard	Tile	Brown	Negative	0.1
1037	21	136	Wall 1	Baseboard	Tile	Black	Negative	0.3
1038	21	136	Wall 2	Stall	Vinyl	Black	Negative	0
1039	21	136	Wall 2	Wall	Tile	White	Negative	0.1
1040	21	136	Wall 3	Wall	Tile	White	Negative	0.2
1041	21	136	Wall 4	Door Unit	Metal	Green	Negative	0
1042	21	136	Wall 4	Floor	Tile	White	Negative	0.1
1043	21	136	Wall 4	Wall	Tile	White	Negative	0.2
1044	10	137	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.3
1045	10	137	Wall 1	Baseboard	Wood	Unpainted	Negative	0
1046	10	137	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1047	10	137	Wall 1	Door	Wood	Unpainted	Negative	0
1048	10	137	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1049	10	137	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
1050	10	137	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0.3
1051	10	137	Wall 3	Window Unit	Metal	Green	Negative	0
1052	10	137	Wall 3	Support Post	Metal	Green	Positive	1.5
1053	10	137	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.2
1054	10	137	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1055	8	138	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.2
1056	8	138	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1057	8	138	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1058	8	138	Wall 3	Wall	Metal	Green	Negative	0.1
1059	8	138	Wall 3	Window Unit	Metal	Green	Negative	0.1
1060	8	138	Wall 3	Support Post	Metal	Green	Positive	2.7
1061	8	138	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1
1062	8	138	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
1063	6	139	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.3
1064	6	139	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1065	6	139	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1066	6	139	Wall 3	Wall	Metal	Green	Negative	0
1067	6	139	Wall 3	Window Unit	Metal	Green	Negative	0.1
1068	6	139	Wall 3	Support Post	Metal	Green	Positive	2
1069	6	139	Wall 3	Unit Ventilator	Metal	Gray	Negative	0
1070	6	139	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1071	4	140	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1072	4	140	Wall 1	Baseboard	Wood	Unpainted	Negative	0
1073	4	140	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1074	4	140	Wall 1	Door	Wood	Unpainted	Negative	0
1075	4	140	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.2
1076	4	140	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0.3
1077	4	140	Wall 3	Wall	Metal	Green	Negative	0
1078	4	140	Wall 3	Window Unit	Metal	Green	Negative	0.1
1079	4	140	Wall 3	Support Post	Metal	Green	Positive	1.6
1080	4	140	Wall 3	Unit Ventilator	Metal	Gray	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1081	4	140	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1082	3	141	Wall 1	Wall	Metal	Green	Negative	0.1
1083	3	141	Wall 1	Window Unit	Metal	Green	Negative	0
1084	3	141	Wall 1	Support Post	Metal	Green	Positive	2.3
1085	3	141	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.1
1086	3	141	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1087	3	141	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
1088	3	141	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1089	3	141	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.3
1090	5	142	Wall 1	Wall	Metal	Green	Negative	0
1091	5	142	Wall 1	Window Unit	Metal	Green	Negative	0.1
1092	5	142	Wall 1	Support Post	Metal	Green	Positive	2.1
1093	5	142	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.1
1094	5	142	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1095	5	142	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1096	5	142	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1097	5	142	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1098	7	143	Wall 1	Wall	Metal	Green	Negative	0.1
1099	7	143	Wall 1	Window Unit	Metal	Green	Negative	0.1
1100	7	143	Wall 1	Support Post	Metal	Green	Positive	1.9
1101	7	143	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.2
1102	7	143	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1103	7	143	Wall 2	Ceiling	Plaster-Gypsum	White	Negative	0
1104	7	143	Wall 3	Baseboard	Wood	Unpainted	Negative	0.2
1105	7	143	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1106	7	143	Wall 3	Door	Wood	Unpainted	Negative	0
1107	7	143	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1108	7	143	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
1109	9	144	Wall 1	Wall	Metal	Green	Negative	0.1
1110	9	144	Wall 1	Window Unit	Metal	Green	Negative	0
1111	9	144	Wall 1	Support Post	Metal	Green	Positive	2.2
1112	9	144	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.1
1113	9	144	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
1114	9	144	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.3
1115	9	144	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1116	9	144	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
1117	11	145	Wall 1	Wall	Metal	Green	Negative	0.1
1118	11	145	Wall 1	Window Unit	Metal	Green	Negative	0
1119	11	145	Wall 1	Support Post	Metal	Green	Positive	1.2
1120	11	145	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.1
1121	11	145	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1122	11	145	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
1123	11	145	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1124	11	145	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.2
1125	13	146	Wall 1	Wall	Metal	Green	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1126	13	146	Wall 1	Window Unit	Metal	Green	Negative	0.2
1127	13	146	Wall 1	Support Post	Metal	Green	Positive	2.5
1128	13	146	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.1
1129	13	146	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.3
1130	13	146	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1131	13	146	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1132	13	146	Wall 3	Baseboard	Wood	Unpainted	Negative	0
1133	13	146	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1134	13	146	Wall 3	Door	Wood	Unpainted	Negative	0
1135	13	146	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.3
1136	15	147	Wall 1	Wall	Metal	Green	Negative	0.1
1137	15	147	Wall 1	Window Unit	Metal	Green	Negative	0.1
1138	15	147	Wall 1	Support Post	Metal	Green	Positive	2.7
1139	15	147	Wall 1	Unit Ventilator	Metal	Gray	Negative	0.2
1140	15	147	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1141	15	147	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
1142	15	147	Wall 3	Door Casing	Wood	Unpainted	Negative	0
1143	15	147	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1144	C18	148	Wall 1	Bar Joist	Metal	Intact	Negative	0
1145	C18	148	Wall 1	Wall	Tile	White	Negative	0
1146	C18	148	Wall 1	Wall	Tile	Black	Negative	0
1147	C18	148	Wall 1	Wall	Tile	Brown	Negative	0
1148	C18	148	Wall 1	Wall	Tile	Green	Negative	0.1
1149	C18	148	Wall 1	Locker	Metal	Green	Negative	0
1150	C18	148	Wall 1	Locker	Metal	Green	Negative	0
1151	C18	148	Wall 1	Locker	Metal	Green	Negative	0
1152	C18	148	Wall 1	Locker	Metal	Brown	Negative	0
1153	C18	148	Wall 1	Locker	Metal	Brown	Negative	0
1154	C18	148	Wall 1	Locker	Metal	Brown	Negative	0
1155	C18	148	Wall 1	Door Casing	Wood	Unpainted	Negative	0
1156	C18	148	Wall 1	Door Unit	Metal	Green	Negative	0
1157	C18	148	Wall 2	Wall	Tile	White	Negative	0
1158	C18	148	Wall 3	Wall	Tile	White	Negative	0.4
1159	C18	148	Wall 3	Locker	Metal	Brown	Negative	0
1160	C18	148	Wall 3	Locker	Metal	Green	Negative	0
1161	C18	148	Wall 4	Fire Ext. Case	Metal	Red	Positive	1.6
1162	C18	148	Wall 4	Door Unit	Metal	Green	Negative	0
1163	C18	148	Wall 4	Drinking Fountain	Tile	White	Negative	0
1164	C22	149	Wall 2	Door Unit	Metal	Green	Negative	0
1165	C22	149	Wall 2	Fire Ext. Case	Metal	Gray	Negative	0.2
1166	C22	149	Wall 2	Wall	Tile	White	Negative	0.3
1167	C22	149	Wall 3	Wall	Tile	White	Negative	0.1
1168	C22	149	Wall 3	Door Unit	Metal	Green	Negative	0
1169	C22	149	Wall 4	Wall	Tile	Green	Negative	0.3
1170	C22	149	Wall 4	Wall	Tile	Brown	Negative	0.2

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1171	C22	149	Wall 4	Wall	Tile	Black	Negative	0.2
1172	C22	149	Wall 4	Wall	Tile	White	Negative	0.3
1173	1	150	Wall 1	Floor	Masonry	Blue	Negative	0
1174	1	150	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1175	1	150	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.3
1176	1	150	Wall 2	Door Unit	Metal	White	Negative	0
1177	1	150	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.2
1178	1	150	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1179	2A	151	Wall 1	Wall	Tile	White	Negative	0
1180	2A	151	Wall 1	Wall	Tile	Green	Negative	0
1181	2A	151	Wall 1	Wall	Tile	Brown	Negative	0
1182	2A	151	Wall 1	Wall	Tile	Black	Negative	0
1183	2A	151	Wall 1	Floor	Tile	White	Negative	0.2
1184	2A	151	Wall 1	Baseboard	Tile	Black	Negative	0
1185	2A	151	Wall 1	Baseboard	Tile	Brown	Negative	0.1
1186	2A	151	Wall 2	Wall	Tile	White	Negative	0.3
1187	2A	151	Wall 3	Wall	Tile	White	Negative	0.1
1188	2A	151	Wall 3	Ceiling	Plaster-Gypsum	White	Negative	0.1
1189	2A	151	Wall 3	Door Unit	Metal	Green	Negative	0
1190	2A	151	Wall 4	Wall	Tile	White	Negative	0.2
1191	2	152	Wall 1	Bar Joist	Metal	Intact	Negative	0
1192	2	152	Wall 1	Wall	Tile	White	Negative	0.1
1193	2	152	Wall 1	Wall	Tile	Green	Negative	0.3
1194	2	152	Wall 1	Wall	Tile	Brown	Negative	0
1195	2	152	Wall 1	Wall	Tile	Black	Negative	0.3
1196	2	152	Wall 1	Baseboard	Tile	Black	Negative	0.4
1197	2	152	Wall 1	Baseboard	Tile	Brown	Negative	0.2
1198	2	152	Wall 2	Stall	Vinyl	Black	Negative	0
1199	2	152	Wall 2	Wall	Tile	White	Negative	0.1
1200	2	152	Wall 3	Wall	Tile	White	Negative	0
1201	2	152	Wall 4	Wall	Tile	White	Negative	0
1202	2C	153	Wall 1	Wall	Tile	White	Negative	0.3
1203	2C	153	Wall 1	Wall	Tile	Green	Negative	0.4
1204	2C	153	Wall 1	Wall	Tile	Brown	Negative	0.2
1205	2C	153	Wall 1	Wall	Tile	Black	Negative	0
1206	2C	153	Wall 1	Baseboard	Tile	Black	Negative	0
1207	2C	153	Wall 1	Baseboard	Tile	Brown	Negative	0.3
1208	2C	153	Wall 2	Wall	Tile	White	Negative	0.2
1209	2C	153	Wall 3	Wall	Tile	White	Negative	0.2
1210	2C	153	Wall 4	Wall	Tile	White	Negative	0.2
1211	2C	153	Wall 4	Door Unit	Metal	Green	Negative	0
1212	2C	153	Wall 4	Ceiling	Plaster-Gypsum	White	Negative	0.3
1213	2B	154	Wall 1	Wall	Tile	White	Negative	0
1214	2B	154	Wall 1	Wall	Tile	Green	Negative	0.3
1215	2B	154	Wall 1	Wall	Tile	Brown	Negative	0.3

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1216	2B	154	Wall 1	Wall	Tile	Black	Negative	0.2
1217	2B	154	Wall 1	Baseboard	Tile	Black	Negative	0.2
1218	2B	154	Wall 1	Baseboard	Tile	Brown	Negative	0.3
1219	2B	154	Wall 2	Stall	Vinyl	Black	Negative	0.1
1220	2B	154	Wall 2	Door Unit	Metal	Green	Negative	0
1221	2B	154	Wall 2	Wall	Tile	White	Negative	0.3
1222	2B	154	Wall 3	Wall	Tile	White	Negative	0
1223	2B	154	Wall 4	Wall	Tile	White	Negative	0.2
1224	C17	155	Wall 1	Wall	Tile	White	Negative	0
1225	C17	155	Wall 2	Wall	Tile	White	Negative	0.2
1226	C17	155	Wall 2	Door Unit	Metal	Green	Negative	0
1227	C17	155	Wall 3	Wall	Tile	White	Negative	0.4
1228	C17	155	Wall 4	Door Casing	Wood	Unpainted	Negative	0
1229	C17	155	Wall 4	Wall	Tile	White	Negative	0
1230	156	156	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.2
1231	156	156	Wall 1	Ceiling	Plaster-Gypsum	White	Negative	0.3
1232	156	156	Wall 1	Baseboard	Wood	Green	Negative	0
1233	156	156	Wall 1	Door Casing	Wood	Green	Negative	0
1234	156	156	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1235	156	156	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1236	156	156	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1237	155A	157	Wall 1	Wall	Tile	White	Negative	0.2
1238	155A	157	Wall 1	Wall	Tile	Green	Negative	0
1239	155A	157	Wall 1	Wall	Tile	Brown	Negative	0
1240	155A	157	Wall 1	Wall	Tile	Black	Negative	0
1241	155A	157	Wall 1	Door Casing	Metal	Green	Negative	0
1242	155A	157	Wall 2	Baseboard	Tile	Brown	Negative	0
1243	155A	157	Wall 2	Baseboard	Tile	Black	Negative	0
1244	155A	157	Wall 2	Stall	Vinyl	Black	Negative	0
1245	155A	157	Wall 2	Wall	Tile	White	Negative	0
1246	155A	157	Wall 3	Wall	Tile	White	Negative	0
1247	155A	157	Wall 4	Wall	Tile	White	Negative	0.1
1248	155A	157	Wall 4	Floor	Tile	White	Negative	0
1249	155	158	Wall 1	Wall	Tile	White	Negative	0.2
1250	155	158	Wall 1	Wall	Tile	Green	Negative	0.1
1251	155	158	Wall 1	Wall	Tile	Brown	Negative	0.1
1252	155	158	Wall 1	Wall	Tile	Black	Negative	0.3
1253	155	158	Wall 1	Baseboard	Tile	Black	Negative	0.3
1254	155	158	Wall 1	Baseboard	Tile	Brown	Negative	0.3
1255	155	158	Wall 1	Door Unit	Metal	Green	Negative	0
1256	155	158	Wall 2	Wall	Tile	White	Negative	0.2
1257	155	158	Wall 3	Wall	Tile	White	Negative	0.3
1258	155	158	Wall 3	Stall	Vinyl	Black	Negative	0
1259	155	158	Wall 4	Wall	Tile	White	Negative	0.2
1260	155	158	Wall 4	Light	Wood	White	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1261	154	159	Wall 1	Bar Joist	Metal	Intact	Negative	0
1262	154	159	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1263	154	159	Wall 1	Light	Wood	White	Negative	0.1
1264	154	159	Wall 1	Door Unit	Metal	Green	Negative	0.1
1265	154	159	Wall 2	Baseboard	Wood	Green	Negative	0
1266	154	159	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1267	154	159	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1268	154	159	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1269	Security	161	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1
1270	Security	161	Wall 1	Unit Ventilator	Metal	White	Negative	0
1271	Security	161	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1272	Security	161	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1273	Security	161	Wall 3	Door Unit	Metal	Green	Negative	0
1274	Security	161	Wall 4	Window Unit	Metal	Gray	Negative	0
1275	Security	161	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
1276	100A	162	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.2
1277	100A	162	Wall 2	Wall	Metal	Green	Negative	0.1
1278	100A	162	Wall 2	Window Unit	Metal	Green	Negative	0.1
1279	100A	162	Wall 2	Support Post	Metal	Green	Positive	4.2
1280	100A	162	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1281	100A	162	Wall 4	Door Unit	Metal	Green	Negative	0
1282	100A	162	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1283	100C	163	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1284	100C	163	Wall 2	Wall	Metal	Green	Negative	0
1285	100C	163	Wall 2	Window Unit	Metal	Green	Negative	0.1
1286	100C	163	Wall 2	Support Post	Metal	Green	Positive	4.2
1287	100C	163	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1288	100C	163	Wall 4	Door Unit	Metal	Green	Negative	0
1289	100C	163	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1290	100E	164	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1291	100E	164	Wall 2	Wall	Metal	Green	Negative	0
1292	100E	164	Wall 2	Window Unit	Metal	Green	Negative	0.2
1293	100E	164	Wall 2	Support Post	Metal	Green	Positive	5.7
1294	100E	164	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
1295	100E	164	Wall 4	Door Unit	Metal	Green	Negative	0
1296	100E	164	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1297	100J	165	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1298	100J	165	Wall 2	Wall	Metal	Green	Negative	0.1
1299	100J	165	Wall 2	Window Unit	Metal	Green	Negative	0
1300	100J	165	Wall 2	Support Post	Metal	Green	Positive	5.4
1301	100J	165	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1302	100J	165	Wall 4	Door Unit	Metal	Green	Negative	0
1303	100J	165	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1304	101	166	Wall 1	Bar Joist	Metal	Intact	Negative	0
1305	101	166	Wall 1	Wall	Plaster-Gypsum	White	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1306	101	166	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1307	101	166	Wall 2	Window Unit	Metal	Green	Negative	0
1308	101	166	Wall 2	Door Unit	Metal	Green	Negative	0.1
1309	101	166	Wall 2	Support Post	Metal	White	Positive	6
1310	101	166	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1311	101	166	Wall 4	Door Unit	Metal	Green	Negative	0
1312	101	166	Wall 4	Window Unit	Metal	Green	Negative	0
1313	101	166	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1314	100	167	Wall 1	Bar Joist	Metal	Intact	Negative	0
1315	100	167	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1316	100	167	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1317	100	167	Wall 2	Sky Light	Wood	White	Negative	0
1318	100	167	Wall 2	Door Unit	Metal	Green	Negative	0
1319	100	167	Wall 2	Closet Wall	Plaster-Gypsum	White	Negative	0
1320	100	167	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
1321	100	167	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1322	100H	168	Wall 1	Wall	Tile	White	Negative	0.2
1323	100H	168	Wall 1	Wall	Tile	Green	Negative	0.1
1324	100H	168	Wall 1	Wall	Tile	Brown	Negative	0.3
1325	100H	168	Wall 1	Wall	Tile	Black	Negative	0.1
1326	100H	168	Wall 1	Baseboard	Tile	Black	Negative	0.1
1327	100H	168	Wall 1	Baseboard	Tile	Brown	Negative	0.2
1328	100H	168	Wall 2	Wall	Tile	White	Negative	0.1
1329	100H	168	Wall 3	Wall	Tile	White	Negative	0.1
1330	100H	168	Wall 4	Ceiling	Wood	White	Negative	0.1
1331	100H	168	Wall 4	Door Unit	Metal	Green	Negative	0
1332	100H	168	Wall 4	Wall	Tile	White	Negative	0.1
1333	102	169	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1334	102	169	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1335	102	169	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1336	102	169	Wall 3	Light	Wood	White	Negative	0
1337	102	169	Wall 4	Door Unit	Metal	Green	Negative	0
1338	102	169	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1339	105	170	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1340	105	170	Wall 1	Door Unit	Metal	Green	Negative	0
1341	105	170	Wall 1	Window Unit	Metal	Green	Negative	0
1342	105	170	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1343	105	170	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1344	105	170	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1345	105	170	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1346	104F	171	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1347	104F	171	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1348	104F	171	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1349	104F	171	Wall 3	Door Unit	Metal	Green	Negative	0
1350	104F	171	Wall 4	Window Unit	Metal	Green	Negative	0

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1351	104F	171	Wall 4	Wall	Metal	Green	Negative	0.1
1352	104E	172	Wall 1	Wall	Tile	White	Negative	0.2
1353	104E	172	Wall 1	Wall	Tile	Green	Negative	0
1354	104E	172	Wall 1	Wall	Tile	Brown	Negative	0.1
1355	104E	172	Wall 1	Wall	Tile	Black	Negative	0.3
1356	104E	172	Wall 1	Baseboard	Tile	Black	Negative	0.1
1357	104E	172	Wall 1	Baseboard	Tile	Brown	Negative	0.1
1358	104E	172	Wall 2	Wall	Tile	White	Negative	0.2
1359	104E	172	Wall 3	Wall	Tile	White	Negative	0.1
1360	104E	172	Wall 4	Door Unit	Metal	Green	Negative	0
1361	104E	172	Wall 4	Wall	Tile	White	Negative	0.2
1362	104D	173	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1363	104D	173	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.2
1364	104D	173	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1365	104D	173	Wall 4	Window Unit	Metal	Green	Negative	0.1
1366	104D	173	Wall 4	Wall	Metal	Green	Negative	0
1367	104C	174	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1368	104C	174	Wall 1	Door Unit	Metal	Green	Negative	0
1369	104C	174	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1370	104C	174	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1371	104C	174	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1372	104A	175	Wall 4	Structural Steel	Metal	Intact	Negative	0.2
1373	104A	175	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1374	104A	175	Wall 2	Wall	Plaster-Gypsum	White	Negative	0.1
1375	104A	175	Wall 2	Door Unit	Metal	Green	Negative	0
1376	104A	175	Wall 3	Wall	Plaster-Gypsum	White	Negative	0.1
1377	104A	175	Wall 4	Window Unit	Metal	Green	Negative	0
1378	104A	175	Wall 4	Wall	Metal	Green	Negative	0
1379	153H	176	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1380	153H	176	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1381	153H	176	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1382	153H	176	Wall 4	Door Unit	Metal	Green	Negative	0
1383	153H	176	Wall 4	Wall	Plaster-Gypsum	White	Negative	0
1384	153G	177	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1385	153G	177	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1386	153G	177	Wall 2	Door Unit	Metal	Green	Negative	0
1387	153G	177	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1388	153G	177	Wall 4	Unit Ventilator	Wood	White	Negative	0
1389	153G	177	Wall 4	Window Unit	Metal	Green	Negative	0
1390	153G	177	Wall 4	Wall	Plaster-Gypsum	White	Negative	0.1
1391	153F	178	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1392	153F	178	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1393	153F	178	Wall 2	Door Unit	Metal	Green	Negative	0
1394	153F	178	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1395	153F	178	Wall 4	Window Unit	Metal	Green	Negative	0.1

XRF & Labs								
Reading #	Room	Test #	Wall	Component	Substrate	Color	Results	mg/cm2
1396	153F	178	Wall 4	Support Post	Metal	Green	Positive	4.8
1397	153F	178	Wall 4	Unit Ventilator	Wood	Green	Negative	0
1398	153F	178	Wall 4	Wall	Metal	Green	Negative	0
1399	153D	179	Wall 1	Wall	Plaster-Gypsum	White	Negative	0
1400	153D	179	Wall 2	Wall	Plaster-Gypsum	White	Negative	0
1401	153D	179	Wall 2	Door Unit	Metal	Green	Negative	0
1402	153D	179	Wall 2	Door Unit	Metal	Green	Negative	0
1403	153D	179	Wall 3	Wall	Plaster-Gypsum	White	Negative	0
1404	153D	179	Wall 4	Wall	Metal	Green	Negative	0.1
1405	153D	179	Wall 4	Window Unit	Metal	Green	Negative	0
1406	153D	179	Wall 4	Unit Ventilator	Wood	Green	Negative	0
1407	153C	180	Wall 4	Structural Steel	Metal	Intact	Negative	0
1408	Exterior	300	Wall 2	Window Unit	Metal	Intact	Negative	0
1409	Exterior	300	Wall 1	Wall	Brick	Intact	Negative	0
1410	Exterior	300	Wall 2	Wall	Brick	Intact	Negative	0
1411	Exterior	300	Wall 2	Door Unit	Metal	Intact	Negative	0
1412	Exterior	300	Wall 1	Window Unit	Metal	Intact	Negative	0
1413	Exterior	300	Wall 1	Support Post	Metal	Intact	Negative	0
1414	Exterior	300	Wall 1	Support Post	Metal	Intact	Negative	0
1415	Exterior	300	Wall 1	Overhang	Plaster-Gypsum	Intact	Negative	0
1416	Exterior	300	Wall 1	Overhang	Metal	Intact	Negative	0.3
1417	Exterior	300	Wall 4	Wall	Brick	Intact	Negative	0
1418	Exterior	300	Wall 4	Door Unit	Metal	Intact	Negative	0
1419	Exterior	300	Wall 4	Window Unit	Metal	Intact	Negative	0
1420	Exterior	300	Wall 4	Overhang	Metal	Intact	Negative	0
1421	Exterior	300	Wall 4	Overhang	Plaster-Gypsum	Intact	Negative	0
1422	Exterior	300	Wall 4	Stair Landing	Metal	Intact	Negative	0

Confirmed Positive Component Types

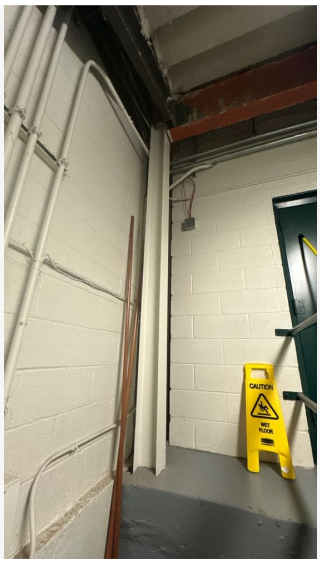
1



Room 201 access door pos

Project: Barton & Loguidice
Date: 10/8/2024, 4:22pm
Creator: Tyler Sanderhoff

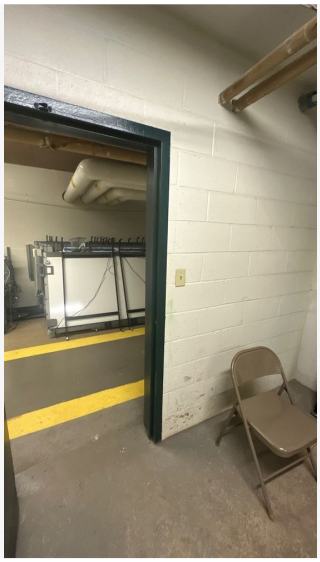
2



Room C54
Wall I beam

Project: Barton & Loguidice
Date: 10/8/2024, 4:25pm
Creator: Daryl Heffron

3



Room 61
Door unit

Project: Barton & Loguidice
Date: 10/8/2024, 4:28pm
Creator: Daryl Heffron

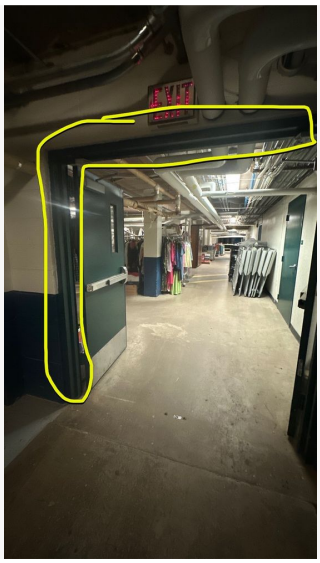
4



Room 203
support posts

Project: Barton & Loguidice
Date: 10/8/2024, 4:40pm
Creator: Tyler Sanderhoff

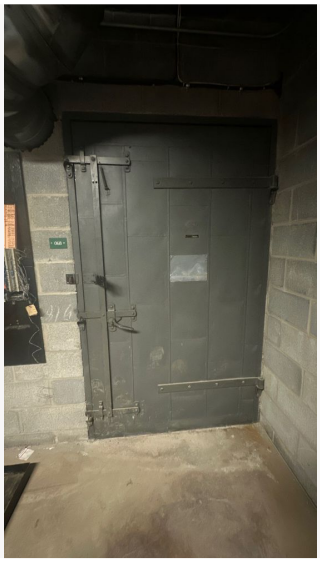
5



Room 65/Crawl 12
Door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:00pm
Creator: Daryl Heffron

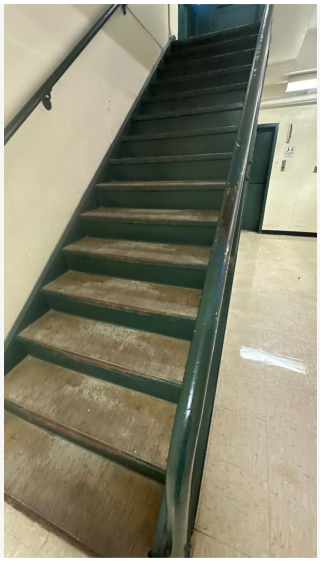
6



Room 70
Door and door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:10pm
Creator: Daryl Heffron

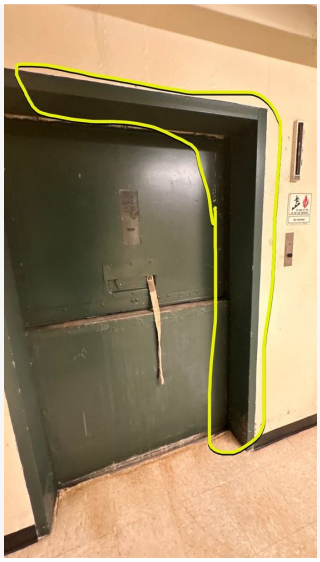
7



Room 58
Tread nose &
Riser

Project: Barton & Loguidice
Date: 10/8/2024, 5:23pm
Creator: Daryl Heffron

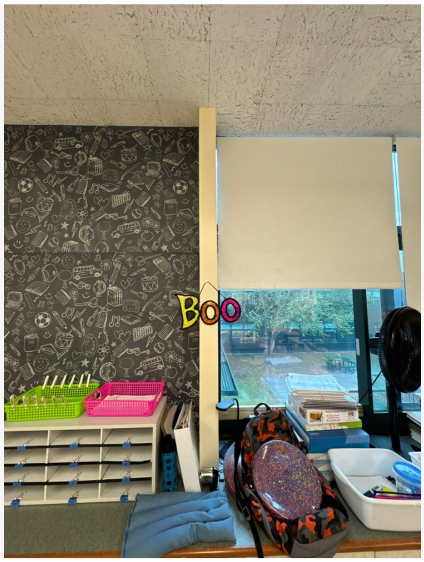
8



Room 58
Elevator door Casing

Project: Barton & Loguidice
Date: 10/8/2024, 5:25pm
Creator: Daryl Heffron

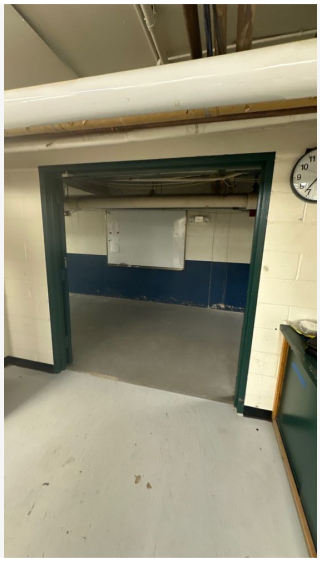
9



Rm 210
support post

Project: Barton & Loguidice
Date: 10/8/2024, 5:30pm
Creator: Tyler Sanderhoff

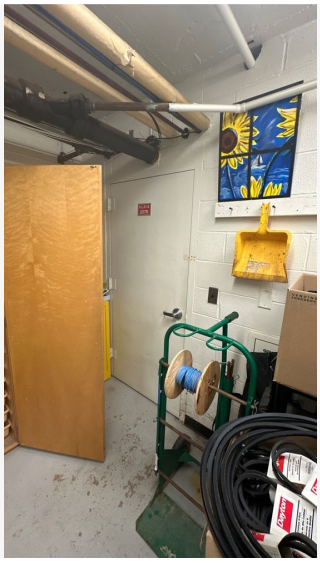
10



Room 82
Door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:36pm
Creator: Daryl Heffron

11



Room 82
Door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:38pm
Creator: Daryl Heffron

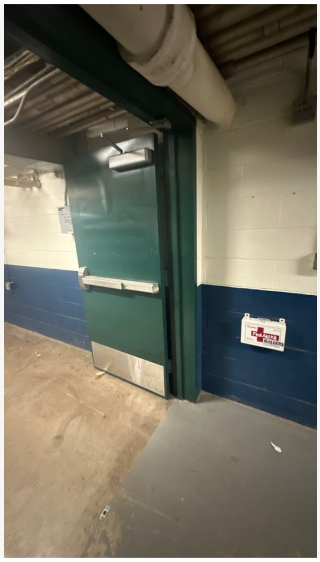
12



Hall C46
Fire extinguisher case

Project: Barton & Loguidice
Date: 10/8/2024, 5:44pm
Creator: Tyler Sanderhoff

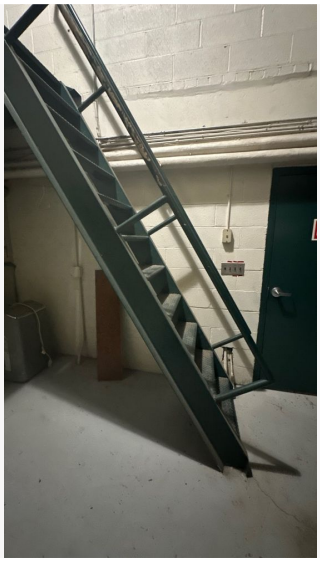
13



Room C61
Door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:45pm
Creator: Daryl Heffron

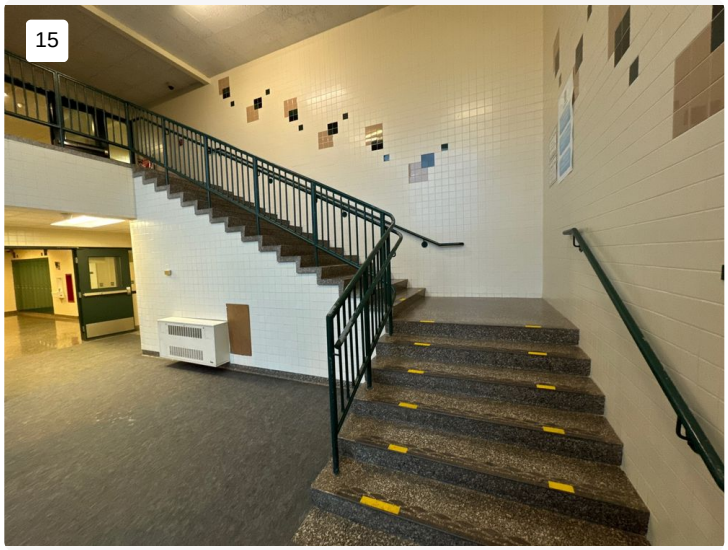
14



Boiler room 84
Stair stringer,
Railing & door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:50pm
Creator: Daryl Heffron

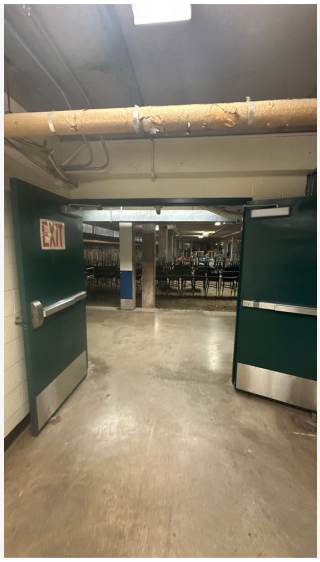
15



Room S5 (Stair)
Handrails, top rails & post

Project: Barton & Loguidice
Date: 10/8/2024, 5:54pm
Creator: Tyler Sanderhoff

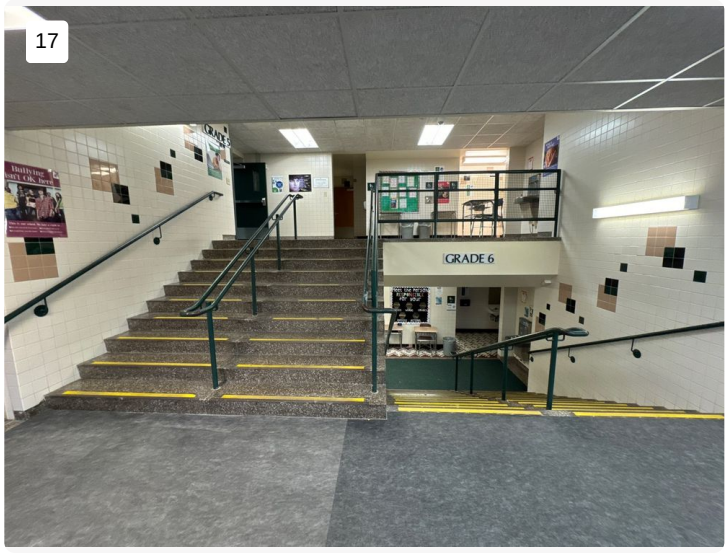
16



Room 85
Door unit

Project: Barton & Loguidice
Date: 10/8/2024, 5:57pm
Creator: Daryl Heffron

17



Room S5 (Stair)
Railings

Project: Barton & Loguidice
Date: 10/8/2024, 6:02pm
Creator: Tyler Sanderhoff

18



Room 128
Support post

Project: Barton & Loguidice
Date: 10/8/2024, 6:24pm
Creator: Daryl Heffron

19



Hall C13
Fire extinguisher case

Project: Barton & Loguidice
Date: 10/8/2024, 8:27pm
Creator: Daryl Heffron

20



Room 122
Stringer

Project: Barton & Loguidice
Date: 10/8/2024, 8:43pm
Creator: Daryl Heffron

21



Room 118
Support post

Project: Barton & Loguidice
Date: 10/8/2024, 9:01pm
Creator: Daryl Heffron

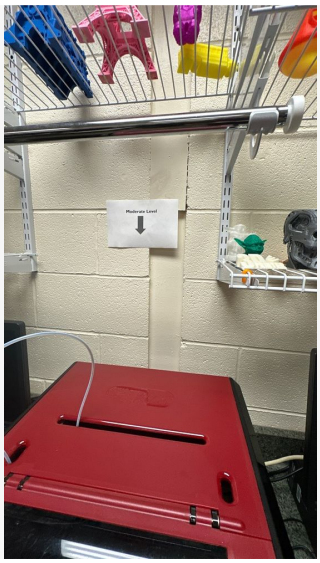
22



Room 18
Ceiling i-beam

Project: Barton & Loguidice
Date: 10/8/2024, 9:05pm
Creator: Daryl Heffron

23



Room 118A wall ibeam

Project: Barton & Loguidice
Date: 10/8/2024, 9:10pm
Creator: Daryl Heffron

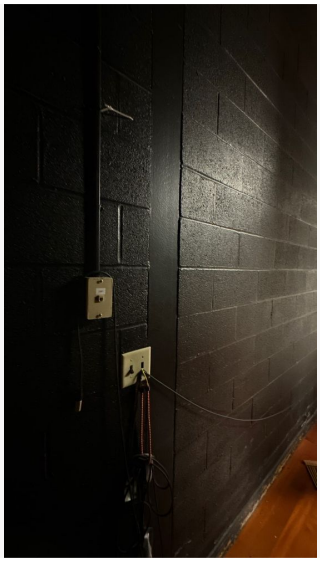
24



Room 101
support post

Project: Barton & Loguidice
Date: 10/8/2024, 9:42pm
Creator: Tyler Sanderhoff

25



Stage 114
Wall I-Beam

Project: Barton & Loguidice
Date: 10/8/2024, 9:45pm
Creator: Daryl Heffron

26



Hall C7
Fire extinguisher case

Project: Barton & Loguidice
Date: 10/8/2024, 10:09pm
Creator: Daryl Heffron

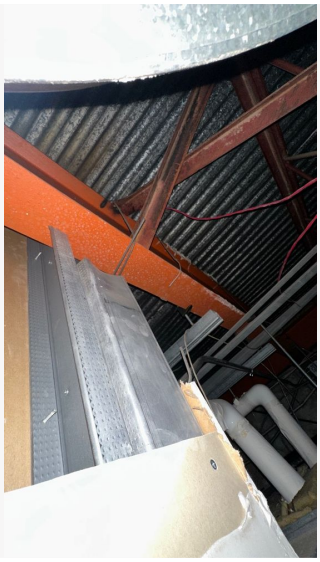
27



Rooms 115 & 117
Ceiling i-beam
Support post

Project: Barton & Loguidice
Date: 10/8/2024, 10:13pm
Creator: Daryl Heffron

28



Room 124A
Ceiling I-beam

Project: Barton & Loguidice
Date: 10/8/2024, 10:17pm
Creator: Daryl Heffron

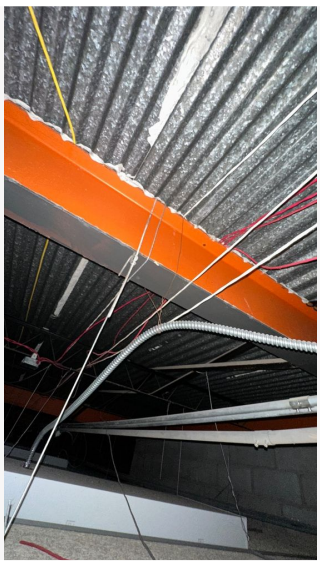
29



Room 138, 142 & 143
Ceiling i-beam

Project: Barton & Loguidice
Date: 10/8/2024, 10:23pm
Creator: Daryl Heffron

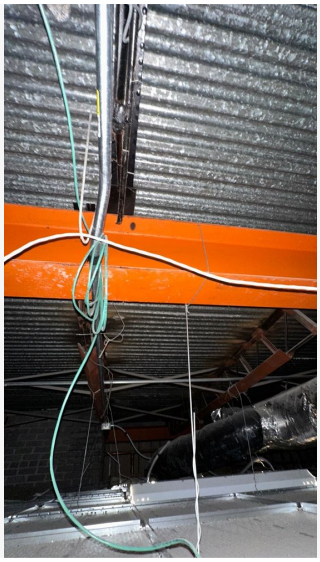
30



Hall C4
Ceiling i-beam

Project: Barton & Loguidice
Date: 10/15/2024, 6:49pm
Creator: Daryl Heffron

31



Room 152 & 151
Ceiling I-Beam

Project: Barton & Loguidice
Date: 10/15/2024, 6:54pm
Creator: Daryl Heffron

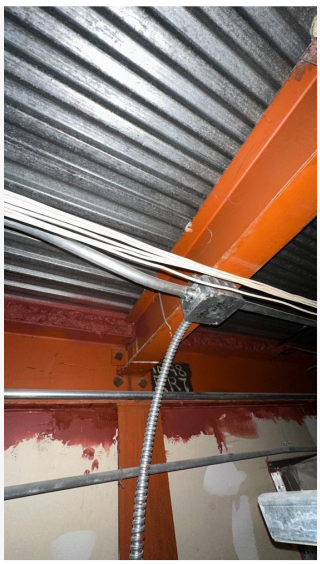
32



Room S4 (Stair)
Ceiling i-beam

Project: Barton & Loguidice
Date: 10/15/2024, 7:12pm
Creator: Daryl Heffron

33



Hall C46
Ceiling i-beam

Project: Barton & Loguidice
Date: 10/15/2024, 7:22pm
Creator: Daryl Heffron

Signature Page

The Individual listed below completed XRF testing at the Gillette Middle School Building:

Daryl Heffron, Risk Assessor

United States Environmental Protection Agency

This is to certify that



Daryl R Heffron

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 30, 2027

LBP-R-121052-3

Certification #

February 07, 2024

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

Performance Characteristic Sheet

EFFECTIVE DATE: February 1, 2022

MANUFACTURER AND MODEL:

Make: ***SciAps***
Models: ***Model X-550***
X-Ray Source: ***Rhodium (Rh) or Gold (Au) Anode***

FIELD OPERATION GUIDANCE

ACTION LEVEL SETTING:

1.0 mg/cm^2

OPERATING PARAMETERS:

Timed mode: fixed 10-second reading.

Quick mode: variable-time reading (approximately 2-6 seconds).

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive) on NIST SRM 2579 (1.02 mg/cm^2)/NIST SRM 2573, or equivalent

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

Au Anode (quick) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0
Rh Anode (Timed or Quick), Au Anode (Timed) **READING DESCRIPTION**	**SUBSTRATE**	**THRESHOLD (mg/cm^2)**
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	0.9 0.9 0.9 0.9 0.9 0.9

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, 2012 Edition ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in February 2022, with two separate instruments of each Anode type, operated in both Timed and Quick modes.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film; for NIST SRM 2579a, use film 2573 (1.04 mg/cm^2).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below. Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this

procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

The reading time in Archive tests was 10 seconds in Timed mode and from 2-6 seconds in Quick mode, for both the Rh Anode and Au Anode.

CLASSIFICATION OF RESULTS:

XRF results for the Au Anode in Quick mode are classified as **positive** if they are **greater than or equal** to 1.0 mg/cm^2 and ***negative*** if they are ***less than*** *to* 1.0 mg/cm^2. XRF results for the Au Anode in Timed mode and for the Rh Anode in Timed or Quick mode are classified as **positive** if they are **greater than or equal** to 0.9 mg/cm^2 and ***negative*** if they are ***less than*** *to* 0.9 mg/cm^2

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to develop Performance Characteristic Sheets at the Federal standard (Action Level) of 1.0 mg/cm^2 and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

Performance Characteristic Sheet

EFFECTIVE DATE: **December 1, 2015**

MANUFACTURER AND MODEL:

Make: ***Heuresis***
Models: ***Model Pb200i***
Source: ***^{57}Co, 5 mCi (nominal – new source)***

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Action Level mode

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive)

SUBSTRATE CORRECTION:

Not applicable

INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm^2 for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm^2 at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

> Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm^2. Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.
>
> Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.
>
> <u>For each substrate type</u> (the 1.02 mg/cm^2 NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):
>
> Correction value = (1st + 2nd + 3rd + 4th + 5th + 6th *Reading*)/6 - 1.02 mg/cm^2
>
> Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm^2. The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm^2)	**Mean Reading Time (seconds)**	**Standard Deviation (seconds)**
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
≥ 1.5	3.32	0.05

CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm^2), and *negative* if they are *less than* the threshold.

DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95-008-september-1997.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

United States Environmental Protection Agency

This is to certify that



Tyler R Sanderhoff

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires May 29, 2026

LBP-R-I249703-1

Certification #

May 15, 2023

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

United States Environmental Protection Agency

This is to certify that

Eco-Testing Services, LLC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 30, 2024

LBP-F229091-1

Certification #

September 16, 2021

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

SECTION 030130.71 – REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary General Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section specifies partial-depth concrete rehabilitation / restoration by application of a cementitious restoration mortar following proper removal of deteriorated concrete and surface preparation.

B. Related Requirements:

1. Division 01 Section “Special Inspection and Testing”
2. Division 01 Section “Allowances”
3. Division 01 Section “Unit Prices”
4. Division 03 Section “Fiber-Reinforced Polymer Reinforcement of Concrete”

1.3 SUBMITTALS

A. Electronically submit product data sheets and Material Safety Data Sheets for each type of material required, including certification that each type complies with the specified requirements.

1.4 QUALITY ASSURANCE

A. Quality Control procedures performed by the Manufacturer shall include, but not be limited to the following:

1. The Manufacturer shall have a minimum five years’ experience in manufacturing concrete restoration materials that meet or exceed the specified requirements herein.
2. The Manufacturer shall have an ongoing quality assurance program independently audited on a regular basis, resulting in documented verification testing that can be presented to the specifier that indicates the manufactured materials perform as claimed in product literature.

B. Quality Control procedures performed by the Contractor shall include, but not be limited to the following:

1. The Contractor shall be experienced in all aspects of concrete restoration, including removal of deteriorated concrete, substrate preparation, and mixing/batching, application, finishing, and curing of restoration materials in conformance with specified requirements and product manufacturer’s installation instructions. The minimum level of experience shall be three years with at least five successful installations on projects of similar size, complexity and scope that can be submitted as references for Engineer review.
2. The Contractor shall maintain qualified personnel on site at all times during installation activities.

C. Special Inspections: See Section 014533 - “Special Inspection and Testing” for a description of the special inspection and testing to be paid for by the Owner and for the extent of the Contractor’s responsibilities with regard to the Special Inspection and Testing program.

D. Pre-Installation Conference: Conduct at the Project site.

1. A minimum of two weeks prior to performing the restoration work, convene a preconstruction meeting with the Owner’s representative, General Contractor, Installing Contractor, Special Inspector, Testing Laboratory, and the Architect and Engineer.
2. The meeting agenda shall include, but no be limited to, review of work schedule, extent of work, materials to be installed, installation equipment and procedures, material storage, staging and batching, installation and use of scaffolding, safety procedures, cleaning, and special inspection and testing requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. All material shall be delivered, stored and handled so as to prevent damage to structures, inclusion of foreign materials and damage to materials by capillary action, rain, snow or breakage.
2. Deliver products in original factory packaging, bearing identification of product, manufacturer, batch number, and expiration date. Furnish Material Safety Data Sheets to the project superintendent and other applicable persons for each product.
3. Store products in a location protected from freezing, damage, construction activity, precipitation and direct sunlight in strict accordance with the manufacturer's recommendations.
4. Condition products to approximately 65 to 85 deg F prior to use, in accordance with the manufacturer's recommendations.
5. Continuity: Arrange deliveries to provide sufficient quantities for continuity of work.

B. Handle all products with appropriate precautions and care as stated on the Material Safety Data Sheets.

PART 2 - PRODUCTS

2.1 GENERAL

A. Bonding agent / anti-corrosion coating and restoration mortar must be compatible and from the same manufacturer.

2.2 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Sika Corporation
2. The Euclid Chemical Company
3. BASF

2.3 BONDING AGENT / ANTI-CORROSION COATING

A. Three-component, moisture-tolerant, breathable, epoxy-modified cementitious bonding agent and anti-corrosion coating complying with the following requirements:

1. Pot life: At least 30 minutes
2. Minimum bond strength (ASTM C 882): 2,480 psi at 14 days
3. Minimum compressive strength (ASTM C109): 4,500 psi at 28 days (1 hr open time)
4. Minimum splitting tensile strength (ASTM C 496): 600 psi at 28 days

B. Acceptable Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. Sika Armatec 110 EpoCem, by Sika Corp.
2. DuralPrep AC, by The Euclid Chemical Co.
3. MasterEmaco P124, by BASF

2.4 RESTORATION MORTAR FOR VERTICAL OR OVERHEAD SURFACES

A. Single or two-component, fast-setting, non-sag, corrosion-inhibiting, polymer-modified cementitious restoration mortar for vertical / overhead applications complying with the following requirements:

1. Application (working) time: Approximately 15 minutes
2. Minimum bond strength (ASTM C 882 modified): 2,000 psi at 28 days
3. Minimum compressive strength (ASTM C 109): 6,000 psi at 28 days
4. Minimum splitting tensile strength (ASTM C 496): 550 psi at 28 days

B. Acceptable Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. SikaTop 123 PLUS, by Sika Corp.
2. Speed Crete PM, by The Euclid Chemical Co.
3. MasterEmaco N425, by BASF

2.5 RESTORATION MORTAR FOR HORIZONTAL SURFACES

A. Single or two-component, extendable, fast-setting, corrosion-inhibiting, cementitious screed mortar for horizontal applications complying with the following properties:

1. Application (working) time: Approximately 30 minutes
2. Minimum bond strength (ASTM C 882 modified): 2,000 psi at 28 days
3. Minimum compressive strength (ASTM C 109): 6,000 psi at 28 days
4. Minimum splitting tensile strength (ASTM C 496): 600 psi at 28 days

B. Acceptable Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. SikaTop 111 PLUS, by Sika Corp.
2. Express Repair, by The Euclid Chemical Co.
3. MasterEmaco T310CI, by BASF

PART 3 - EXECUTION

3.1 GENERAL

A. Where possible, barricade area above to prevent vehicular traffic from loading and vibrating structural members being rehabilitated or restored. Maintain barricades for a minimum of 24 hours after completion of repair, unless noted otherwise.

B. Provide temporary shoring where indicated on Drawings or as directed by Engineer. Means and method of temporary shoring is the responsibility of the Contractor.

C. Strictly follow all application instructions from product manufacturers. Where product manufacturer’s requirements conflict with requirements herein or on Drawings, the more stringent requirements shall apply.

D. Base bid restoration quantities shown on Drawings are approximate and for contractor reference purposes only. Actual quantities shall be verified in field, and payment adjusted based on Unit Prices.

3.2 PREPARATION FOR CONCRETE RESTORATION AREAS

A. See Drawings for approximate locations and extent of spalled or deteriorated concrete requiring restoration. Determine and mark the extent of the areas to be restored. Sound the concrete with a hammer to determine the extent of deteriorated concrete.

B. Mark out perimeter of concrete repair area. Use a minimal number of straight lines. All corners shall be 90 degrees or greater. No re-entrant (inside) corners allowed. Determine and record repair area to nearest 0.1 square foot.

C. Drill corners of restoration area perimeter with 1” diameter (minimum) bit to a depth of 1/2”. Saw-cut 1/2" deep continuous between drilled corners for entire perimeter. Do not overcut at corners.

D. Remove unsound concrete within restoration area using nothing more powerful than a small electric chipping hammer. Microcracking and/or microdelamination can occur if too powerful of removal methods are used. Do not damage adjacent elements. Chip out all concrete within the cut lines to a minimum depth of 1/2". At all reinforcing bars exposed for at least half of their circumference, chip out all concrete to provide a minimum clearance of 3/4" behind bar.

E. Surface condition at restoration area shall have an exposed aggregate surface complying with ICRI CSP-6 or rougher. Carefully inspect cleaned concrete and remove aggregate particles that have been cracked or fractured.

F. Using hand tools, remove all rust laminations from exposed reinforcing steel. If existing reinforcing steel exhibits significant section loss (greater than 15 percent), shore member and notify Engineer for review. Supplemental reinforcing steel, if required, shall be as directed by Engineer and performed on a labor and materials basis.

G. Powerwash substrates with clean water at 1,500 to 3,000 psi and allow surfaces to dry to a saturated-surface-dry condition with no standing water just prior to applying restoration materials.

H. Contact Engineer to review and approve each substrate area prior to application of any coating or restoration material.

3.3 APPLICATION OF BONDING AGENT / ANTI-CORROSION COATING

A. Coat exposed reinforcing steel with two coats of bonding agent / anti-corrosion coating per manufacturer's application instructions and allow to dry.

3.4 APPLICATION OF RESTORATION MORTAR

A. Perform concrete restoration work only at areas where Engineer has approved condition of prepared substrate.

B. Prepare only as much material as can be used at one time.

C. Rewet restoration area surfaces to a saturated-surface-dry condition with no standing water.

D. Apply scrub coat of restoration mortar to substrate.

E. While scrub coat is still wet, begin applying restoration mortar. Force mortar against edges of repair area and work towards center. Take care to fill all voids above and around reinforcing.

F. Do not exceed maximum lift thickness. For restorations requiring two or more lifts of restoration material, score / roughen surface to key-in successive lift. Wait until material reaches final set before applying successive lift. Do not allow restoration material to dry between lifts.

G. For deep horizontal restorations, extend restoration mortar with 3/8" coarse crushed stone aggregate as required in accordance with manufacturer's recommendations.

H. Apply restoration mortar to reproduce the element's original profile.

I. Finish exposed surfaces using a fine broom or bristles.

3.5 CURING

A. Follow ACI recommendations and manufacturer's instructions for curing procedures.

B. Begin curing procedures immediately after final finishing.

C. Curing can be accomplished by moist or wet curing for a period of seven days. Alternatively, cure by application of a liquid membrane-forming curing compound.

1. If a curing compound is used, it must be certified compatible with the repair mortar. Apply one uniform coat for overhead or vertical surfaces and two uniform coats for horizontal surfaces. Do not apply curing compound between lifts of restoration material.

D. Curing system shall not prevent bonding of paint if surface is to be painted.

3.6 PAINTING OF RESTORATION AREAS

A. If the original surface or adjacent surfaces had been painted, paint the restoration area and adjacent affected area.

B. Match the type and color of the existing adjacent paint. Use two coats if necessary for coverage, and a primer, if recommended by the paint manufacturer.

3.7 PROTECTION AND CLEANUP

A. Protect existing conditions during construction. Repair any damage to the system at the Contractor's expense.

B. Clean all work areas of debris, stains, and splatter. Repair damaged, spotted, or smeared areas. If adjacent painted surfaces are affected, apply new, compatible paint to match.

3.8 FIELD QUALITY CONTROL

A. Special Inspections: See Section 014533 - Special Inspections and Testing for a description of the special inspection and testing to be paid for by the Owner and the extent of the Contractor’s responsibilities with regard to the Special Inspections and Testing program.

END OF SECTION 030130.71

SECTION 030130.72 – FIBER-REINFORCED POLYMER REINFORCEMENT OF CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work of this Section shall include furnishing all labor, materials, equipment, and supervision to prepare the surface of the structural concrete members and to install the Fiber-Reinforced Polymer reinforcement and fire-protection covering as indicated on the Drawings.

B. Related Requirements:

1. Division 01 Section “Special Inspection and Testing”
2. Division 01 Section “Unit Prices”
3. Division 03 Section “Rehabilitation of Cast-in-Place Concrete”

1.3 DEFINITIONS

A. Fiber-Reinforced Polymer (FRP) Reinforcement: An acronym commonly used in the composite industry and it refers to plastic and polymer materials that are reinforced with structural fiber such as fiberglass, carbon fiber, or aramid fiber.

1.4 REFERENCE STANDARDS

A. Comply with the following reference standards, except where more stringent requirements are indicated on the Drawings or specified herein:

1. American Concrete Institute (ACI)

   a. ACI 440.8-13, Specification for CFRP and GFRP Materials Made by Wet Layup
   b. ACI 440.2R-17, Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures

2. International Concrete Repair Institute (ICRI)

   a. ICRI Guideline No. 03742, Guide for the Selection of Strengthening Systems for Concrete Structures
   b. ICRI Guideline No. 03739, Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials

3. Sika CarboDur Composite Strengthening Systems – Engineering Guidelines for Design and Application.
4. American Society of Testing and Materials (ASTM) as cited herein.

1.5 QUALITY ASSURANCE

A. Quality Control procedures performed by the Manufacturer shall include, but not be limited to the following:

1. Manufacturer shall have a nationally recognized program of contractor training, certification and technical support.
2. The Manufacturer shall have minimum five years' experience in FRP Reinforcement confirmed by actual field tests of at least 20 successful installations.
3. The Manufacturer shall be able to supply testing data to demonstrate system properties and durability of the actual FRP Reinforcement to be used.

B. Quality Control procedures performed by the Contractor shall include, but not be limited to the following:

1. The Contractor shall be trained by the Manufacturer and shall have completed a program of instruction in the use of FRP Reinforcement.
2. The Contractor shall have a minimum of three years' experience in FRP Reinforcement confirmed by actual field tests of at least five successful installations.

C. Special Inspections: See Section 014533 - "Special Inspection and Testing" for a description of the special inspection and testing to be paid for by the Owner and for the extent of the Contractor's responsibilities with regard to the Special Inspection and Testing program.

D. Pre-Installation Conference: Conduct at the Project site.

1. A minimum of two weeks prior to performing the FRP reinforcing work, convene a preconstruction meeting with the Owner's representative, General Contractor, Installing Contractor, Special Inspector, Testing Laboratory, and the Architect and Engineer.
2. The meeting agenda shall include, but no be limited to, review of work schedule, extent of work, materials to be installed, installation equipment and procedures, material storage, staging and batching, installation and use of scaffolding, safety procedures, cleaning, and special inspection and testing requirements.

1.6 SUBMITTALS

A. Submit for record Material Safety Data Sheets (MSDS) of each product, used on site.

B. Submit product data indicating product standards, physical and chemical characteristics, environmental durability, technical specifications, limitations, installation instructions, and general recommendations regarding each material.

C. Submit for record, a qualification statement by the Contractor listing their completed FRP Reinforcement projects, including size, location, owner, engineer/architect and contact numbers.

D. Submit for record a complete description of the FRP Reinforcing system materials, surface preparation, application procedures, application rates, and cure times.

E. Submit for record copies of purchase order and packaging slips showing quantities and dates of primer and resin purchased.

F. Submit for review and approval shop drawings including, the following:

1. Limits of FRP Reinforcing.
2. Complete system details including, but not limited to, FRP Reinforcement, epoxy mortar, and fire-protective covering and fasteners.
3. Include a description of methods that will be employed to ensure installed laminates are protected from damage by subsequent work.

G. Submit an approved ICC Evaluation Report in the name of the proposed FRP system to be used on this project.

1.7 JOB-SITE CONDITIONS

A. Do not apply FRP Reinforcement materials if raining, snowing, or dew condensation is expected or existing concrete surface is wet or if the ambient or surface temperature are below 40° F.

B. The ambient temperature and temperature of the epoxy components shall be between 50° F and 80° F at the time of mixing. See appropriate technical data sheets for more specific instructions.

C. Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

D. Contractor shall take appropriate measures to ensure installed FRP laminate reinforcing is protected from damage by subsequent work. Laminates that have been damaged shall be removed and replaced at no cost to Owner.

E. The Contractor is solely responsible for fume control and shall take necessary precautions against injury to Installer personnel or adjacent building occupants during application of primer and resin, etc. Contractor personnel shall use protective equipment and area shall be well vented to the outside. As a minimum, Installer must take the following precautions:

1. Contractor to locate and protect building air intake during application.
2. Contractor to follow all state, federal, and local safety regulations.
3. Contractor to follow all Manufacturers' safety requirements as indicated on appropriate MSDS sheets.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened containers with the Manufacturer's name, labels, product identification, and batch numbers.

B. FRP Reinforcement shall be stored in a cool dry area away from direct sunlight, flame, moisture, or other hazards.

C. Store epoxy paste adhesive under conditions as recommended by the Manufacturer in a cool dry place out of direct sunlight. Products that have exceeded their shelf life shall not be used.

D. Contractor is required to confirm that all materials used in accordance with this Section conform to local, state, and federal environmental and worker's safety laws and regulations.

E. During operations Contractor shall maintain barricades.

F. The Contractor shall properly dispose of empty containers in accordance with local regulations.

PART 2 - PRODUCTS

2.1 FRP REINFORCEMENT LAMINATE

A. FRP Precured Strip shall be high strength, high modulus, unidirectional Carbon Fiber Reinforced Polymer (CFRP).

1. FRP Precured Strip shall be of the type, size, layer and location as indicated on the Drawings.
2. FRP Precured Strip, shall meet the following minimum requirements:

Property	Requirement	ASTM Test Method
Laminate Tensile Strength, In primary fiber direction	406,000 psi (2,800 MPa)	D3039
Laminate Tensile Modulus, In primary fiber direction	23.2×10^6 psi (160,000 MPa)	D3039
Laminate Elongation at break	1.69 %	D3039
Laminate Thickness	0.047 in. (1.2 mm)	
Fiber Volume, minimum	68%	D2563

3. Strip Width: 3.94 inches (100 mm)
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika CarboDur Type S, Sika Corp., Lyndhurst, NJ.

2.2 EPOXY PASTE ADHESIVE

A. Epoxy paste adhesive shall be high-modulus, high-strength, 100% solids, moisture tolerant, non-sag structural epoxy paste compliant with ASTM C 881 Type I, IV Grade 3, Class C and AASHTO M-235 specifications.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Sikadur 30, Sika Corp., Lyndhurst, NJ.

PART 3 - EXECUTION

3.1 GENERAL

A. Inspect surfaces to receive the work and report immediately in writing to the Engineer as required in the General Conditions and deficiencies in the surface that render if unsuitable for proper execution of this work.

B. Protect vehicles, concrete, and other items surrounding work area from dust or damage due to Work of this Section.

C. Base bid quantities shown on Drawings are approximate and for contractor reference purposes only. Actual quantities shall be verified in field, and payment adjusted based on Unit Prices.

3.2 SURFACE PREPARATION

A. All concrete surfaces shall be dry and free of surface moisture and frost, and tested by the Contractor to evaluate moisture transmission in accordance with ASTM D 4263 “Indicating Moisture in Concrete by the Plastic Sheet Method.”

B. All concrete surface to receive FRP reinforcement shall be prepared to a minimum concrete surface profile of ICRI CSP-3.

C. All concrete surfaces to receive FRP reinforcement shall be sound. Remove deteriorated concrete, dust, laitance, grease, paint, curing compounds, waxes, impregnations, foreign particles, and other bond inhibiting materials from the surface by blast cleaning or equivalent mechanical means.

D. For FRP reinforcement applied to top surface of concrete floor slabs, grind down slab surface to recess FRP so that top surface of FRP will be flush with adjacent slab surfaces. Intent is to provide a smooth finished floor surface that will not affect the installation or installed finished appearance of subsequent-applied floor finishes.

E. All concrete surfaces shall be air blasted and vacuumed clean to a dust free condition.

F. Concrete surface irregularities less than one inch shall be ground and smoothed and/or filled with an approved repair material (specified Epoxy Paste Adhesive mixed with 1 part oven-dried sand). Surface irregularities shall be limited to less than 0.04 inches (1 mm). Surface irregularities greater than one inch shall be repaired using an approved cementitious repair mortar.

G. The adhesive strength of the concrete shall be verified after preparation by random pull-off testing (ACI 503R) at the direction of the Engineer. Minimum tensile strength is 200 psi with concrete substrate failure, or as approved by the Engineer.

3.3 FRP REINFORCEMENT APPLICATION

A. Apply FRP Precured Strip in accordance with Manufacturer’s recommendations.

B. Care shall be taken not to damage the fibers in handling and unpacking the strips.

C. Strips may be either delivered to project site in factory pre-cut lengths or cut on site. Care must be taken not to fray or otherwise damage the fibers when field cutting. Follow Manufacturer's recommendations for field cutting of strips.

D. Strips shall be cleaned with a fast flashing solvent (e.g. MEK) to remove any bond inhibiting materials. A clean white cotton rag shall be used for this purpose. Continue cleaning the Strip in this manner until no black residue shows on the rag. Cleaning shall be performed the same day the strips are to be used.

E. Apply epoxy paste adhesive onto the prepared concrete surface with a trowel or spatula to a nominal thickness of 1/16-inch. Apply the epoxy mortar to the laminate strips with a roof-shaped spatula to a nominal thickness of 1/16-inch.

F. Within the open time of the epoxy, depending on the temperature, place the laminate strips onto the concrete surface.

G. Using a hard rubber roller, press the laminate into the epoxy adhesive until the adhesive is forced out on both sides.

H. Remove excess adhesive so that no adhesive extends more than 1/8-inch from the laminate edge.

3.4 CURING

A. Protect finished installation of FRP Reinforcement from rain, sand, dust, etc. using protective sheeting or other barriers. Do not allow protective sheeting to come in contact with finished application.

B. Curing of finished application shall be a minimum of 24 hours and in order to achieve full strength curing shall be extended for a period of two weeks at an average ambient temperature of 68°F.

3.5 PROTECTION OF FRP REINFORCING APPLIED TO TOP SURFACES OF SLABS

A. Protect installed FRP reinforcing from subsequent damage by installing a durable protective covering. At a minimum, protective covering shall consist of ½" thick OSB or plywood panel sheathing, fully covering the entire area of FRP reinforcing. Install sheathing panels after FRP reinforcing has been inspected and approved by Special Inspector. Fasten panels to floor slab at perimeter with minimum 3/16" dia. concrete screw anchors spaced 16" o.c. with 1 inch minimum embedment. Fasteners shall be located at least two inches from edge of FRP reinforcing strips.

B. Exposed face of panels shall be painted "Blaze Orange".

C. Contractors shall make their workers and subcontractor workers aware of FRP reinforcing and intent for it to remain undamaged.

D. Any damaged FRP reinforcing shall be reviewed by the Engineer. If Engineer determines damage requires repair or replacement of FRP reinforcing, all costs, including costs associated with Engineer's review, shall be borne by the contractor.

3.6 FIELD QUALITY CONTROL

A. Correct deficiencies in Work that Section 014533 “Special Inspection and Testing” reports and inspections indicate do not comply with the Contract Documents. Costs for correcting Work and any re-testing that may be necessary shall be at the Contractor’s expense.

3.7 REPAIR OF DEFECTS

A. Repair procedures shall be performed in accordance with guidelines established by ACI 440.2R-08 (paragraph 7.2.3) and approved by the Project Engineer. All repairs shall be subject to the same application, curing and quality control specifications as the original work.

END OF SECTION 030130.72

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Extent of cast-in-place concrete work is shown on drawings.

B. Related Requirements:

1. Division 01 Section “Special Inspection and Testing”
2. Division 03 Section “Rehabilitation of Cast-in-Place Concrete”
3. Division 03 Section “Fiber-Reinforced Polymer Reinforcement of Concrete”
4. Division 05 Section “Structural Steel Framing”
5. Division 04 Section “Unit Masonry”
6. Division 31 Section “Building Earthwork”
7. Division 32 Sections for non-building-related concrete pavements and walks

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Cementitious materials
2. Admixtures
3. Form materials and form-release agents
4. Steel reinforcement and accessories
5. Fiber reinforcement
6. Grout
7. Curing compounds
8. Curing and sealing compounds
9. Floor and slab treatments
10. Sealing materials
11. Adhesives
12. Vapor barriers
13. Semi-rigid joint filler

14. Joint-filler strips
15. Repair materials
16. Evaporation retarder
17. Post-installed anchors
18. Related materials

B. Design Mixtures: For each concrete mixture submit field or trial mixture test records used to document that proposed mixture will achieve the average compressive strength and other specified properties in PART 2. Mix design submitted for review shall conform to the requirements of ACI 301.

1. Submit list of ingredients used for the composition of the design mixtures, and their proportions.
2. Indicate amounts of mixing water to be withheld for later addition at Project site.
3. Material Test Reports: For the following, from a qualified testing agency:

    a. Aggregates
    b. Cementitious Materials

4. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Mix design submitted for review shall be representative of the concrete materials currently being used.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Comply with CRSI – Manual of Standard Practice showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement, mechanical connections, tie spacing, hoop spacing. Include special reinforcement required for openings through concrete structures.

1. Reproduction of contract drawings for use as shop drawings is not permitted.
2. Submit erection drawings in Portable Document Format (pdf) to plot a minimum size of 22 inches by 34 inches. Contractor is responsible for making hard copies of reviewed shop drawings and distributing them to subcontractors.
3. AutoCAD and/or Revit Structure files of structural drawings will be available for use subject to acceptance of a Disclaimer.
4. Contractor shall leave a 3-inch high by 4-inch wide blank space in the title block or on cover page in which the review stamp will be placed.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Structural Engineer of Record.

E. Qualification Data: For manufacturer and testing agency.

F. Welding certificates.

G. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 and ASTM C 685 requirements for production facilities and equipment.

1. Batch tickets are required to be provided for each batch of concrete produced and delivered.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents.

1. ACI 117 – 2010, "Specifications for Tolerances for Concrete Construction and Materials."
2. ACI 301 – 2016, "Specifications for Structural Concrete for Buildings."
3. ACI 302.1 – 2004, "Guide for Concrete Floor and Slab Construction."
4. ACI 305R –2020, "Guide to Hot Weather Concreting."
5. ACI 306 – 2016, "Guide to Cold Weather Concreting."
6. ACI 306.1 – 1990, "Standard Specification for Cold Weather Concreting."
7. ACI 308.1 – 2011, "Specification for Curing Concrete."
8. ACI 318 – 2014, "Building Code Requirements for Structural Concrete."
9. ACI 347 – 2021, "Guide to Formwork for Concrete."

D. Reference Standards:

1. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice," 2009.
2. Uniform Code of New York State, 2020.
3. New York State Department of Transportation (NYSDOT) Standard Specifications, 2018.

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated for concrete mixture design and material test reports.

a. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I.
b. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

F. Preinstallation Conference: Conduct conference at Project site.

1. A minimum of two weeks prior to concrete placement, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Convene a preconstruction meeting with the Owner's representative, Contractor's Superintendent,

Contractor's concrete supplier, flatwork installer, Special Inspector, testing laboratory, and the Architect and Engineer.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete mixes, concrete finishes and finishing, cold and hot weather concreting procedures, curing procedures, construction, contraction and isolation joints, and joint filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

G. Special Inspections: See Section 014533 – "Special Inspection and Testing" for a description of the special inspection and testing to be paid for by the Owner and for the extent of the Contractor's responsibilities with regard to the Special Inspection and Testing program.

1.6 FIELD CONDITIONS

A. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

B. Protection of Slab Subgrade Against Heaving: Sequence work, provide temporary heat, or provide sufficient cover as required to prevent subgrade under slabs on grade from heaving or settling due to freezing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Plywood, metal, or other suitable form-facing panels that provide continuous, true, and smooth as-cast concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire, CRSI Class 2 stainless-steel, or other suitable non-ferrous supports.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials or the same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type I/II.
2. Fly Ash: ASTM C 618, Class F or C, with loss on ignition less than 6 percent.
3. Slag Cement: ASTM C 989, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595 Type 1L.

B. Aggregates:

1. General: Aggregates shall have hard, angular, strong, clean, uncoated, durable particles and shall be free of injurious amounts of thin elongated pieces, mica, clay, silt, or organic matter. Aggregates shall be from a single local source with prior record of acceptable use. Tests and analysis shall be no more than 90 days old.
2. Normal-Weight Aggregates: Aggregates shall comply with ASTM C 33.

a. Fine aggregate shall be natural sand or stone screenings, free of materials with deleterious reactivity to alkali in cement. The fineness modulus shall not vary by more than 0.20 throughout the work.

b. Coarse aggregate shall be crushed stone or crushed gravel meeting gradation requirements for ASTM C 33.

1) Provide the largest size of aggregates practical within the gradation limits referenced in paragraph "Concrete Mixtures for Building Elements" below.
2) Crushed gravel shall comply with NYSDOT Standard Specifications Section 703-02.

c. ASTM C 33 Class Designation for Coarse Aggregates:

1) Exterior exposed concrete subject to frequent wetting – Class 4S.
2) Other concrete – Class 3S.

3. Material Test Reports: Submit results from ASTM C 40, C 88, C 117, C 123, C 136, C 142, C 227, C 289, and C 1260 tests for the aggregates to be used in each concrete mix.

C. Water: ASTM C 94 and potable.

D. Admixtures:

1. Air-Entraining Admixture: ASTM C 260.
2. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

a. Water-Reducing Admixture: ASTM C 494, Type A.
b. Retarding Admixture: ASTM C 494, Type B.
c. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
d. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
e. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
f. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
g. Set-Accelerating Admixture: ASTM C494, Type C.

3. Prohibited Admixtures: Calcium chloride thiocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

2.5 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 3/4 inches long.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. "Econo-Net" by Forta
b. "Fibermesh 300-e3" by Propex
c. "Grace Fibers" by Grace Construction Products

2.6 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. “Wirestop” by Paul Murphy Plastics Co.
b. “Greenstreak PVC Waterstop” by Sika
c. “PVC Waterstop” by BoMetals, Inc.

B. Bentonite Strip Waterstops: Provide active bentonite/butyl rubber based waterstops in construction joints and other joints as indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. “Volclay Waterstop-RX” by Cetco
b. “Superstop Waterstop” by Tremco
c. “Swellstop” by Sika

C. See Drawings for location and type of waterstops.

2.7 VAPOR BARRIER

A. Provide vapor barrier under slabs on grade that conforms to ASTM E 1745, Class A, placed over prepared base. Membrane shall have a water-vapor permeance rate no greater than 0.010 perms when tested in accordance with ASTM E 154, Section 7, or ASTM F 1249. Vapor barrier shall be at least 10 mils thick in accordance with ACI 302.1.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

a. “Stego Wrap (15 mil) Vapor Barrier” by Stego Industries LLC.
b. “Viper Vapor Check II (10 or 15 mil)” by Insulation Solutions.
c. “Perminator (15 mil)” by W.R. Meadows.
d. “VaporBlock VB15 (15 mil)” by Viaflex.

2.8 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Products: Subject to compliance with requirements, available products that may be incorporated in the work include, but are not limited to, the following:

a. “Masterflow 928” by BASF Building Systems

b. "SikaGrout 328" by Sika
c. "High Strength Grout" by Five-Star Products
d. "NS Grout" by Euclid.

2.9 EPOXY ADHESIVE FOR ANCHORAGE TO CONCRETE

A. Two-component, high solids, moisture-tolerant, load-bearing structural epoxy adhesive ICC-approved for seismic conditions and anchoring to both uncracked and cracked concrete, and compliant with ASTM C881 Type IV, Grade 3, Classes B and C. See Drawings for fastener materials and additional requirements.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "HIT RE-500 V3" by Hilti
b. "SET-3G" by Simpson Strong-Tie
c. "AC200+" by DeWalt
d. "Epcon G5" by ITW Red-Head
e. "AnchorFix-3001" by Sika

2.10 POST-INSTALLED ANCHORS

A. Expansion Anchor for Anchorage to Concrete, Solid Masonry or Grouted Masonry:

1. Carbon steel stud type, sized as shown, complying with ASTM A 510, zinc plated in accordance with ASTM B633. See Drawings for additional information.

a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1) "Kwik Bolt 3" by Hilti
2) "Power Stud" by DeWalt
3) "Red-Head Trubolt" by ITW Red-Head
4) "Wedge-All" by Simpson Strong-Tie

B. Screw Anchor for Anchorage to Concrete, Solid Masonry or Grouted Masonry:

1. Interior Conditions and Where Not Anchoring Galvanized Steel Elements: Single-piece, fully-removable, zinc-plated carbon steel anchor with a hex-washer head. See Drawings for additional information.

a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1) "Kwik HUS-EZ" by Hilti
2) "Screw-Bolt+" by DeWalt
3) "Large Diameter Tapcon (LDT)" by ITW Red-Head
4) "Titen HD" by Simpson Strong-Tie

2. Exterior Conditions or Where Anchoring Galvanized Steel Elements: Single-piece, fully-removable, galvanized carbon steel anchor with a hex-washer head. See Drawings for additional information.

    a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

        1) "Kwik HUS-EZ CRC" by Hilti
        2) "Screw-Bolt+" by DeWalt
        3) "Titen HD" by Simpson Strong-Tie

C. Adhesive Anchor for Anchorage to Hollow Masonry:

1. Two-component adhesive anchor system for anchorage utilizing zinc-plated carbon steel threaded rod and screen tubes. See Drawings for additional information.

    a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

        1) "HIT-HY 70 System" by Hilti
        2) "AC100 + Gold System" by DeWalt
        3) "Epcon A7 System" by ITW Red-Head
        4) "SET-XP" by Simpson Strong-Tie

D. Sleeve Anchor for Anchorage to Hollow Masonry: Single-piece, zinc-plated carbon steel sleeve anchor with threaded end and zinc-plated hex nut and washer. See Drawings for additional information.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

    a. "HLC-HX" by Hilti
    b. "Lok-Bolt AS" by DeWalt
    c. "Dynabolt Sleeve Anchor" by ITW Red-Head

2.11 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Hardener: VOC-compliant, clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. "Ashford Formula" by Curecrete Distribution Inc.
    b. "Sure Hard Densifier J17" by Dayton Superior
    c. "Euco Diamond Hard" by Euclid
    d. "LIQUI-HARD" by W.R. Meadows

2.12 CURING MATERIALS

A. Semi-Transparent Membrane-Forming Curing Compound: Liquid type, dissipating, water based, VOC compliant, membrane-forming curing compound complying with ASTM C 309, Type 1D, Class B, containing fugitive red dye in adequate proportions to remain visible on concrete surface for 24 hours. Moisture loss not more than 0.55 kg/m^2 in 72 hours. Compound shall be removable to not affect bond of applied floor finish. Material shall be semi-transparent to aid in placement.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "1100 with Fugitive Red Dye" by W.R. Meadows
b. "Kurez DR-100 with Fugitive Red Dye" by Euclid
c. "Resin Cure with Dye J11WD" by Dayton Superior
d. "Thinfilm 420 with Red Dye Resin" by Kaufman

B. Membrane-Forming Curing and Sealing Compound: Liquid type, non-yellowing, water based, VOC compliant, membrane-forming curing and sealing compound complying with ASTM C 309, Type 1, Class B and ASTM C 1315, Type 1, Class A. Moisture loss not more than 0.55 kg/m2 in 72 hours.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "VOCOMP-20" by W.R. Meadows
b. "Diamond Clear VOX" by Euclid
c. "Cure & Seal 1315EF" by Dayton Superior
d. "Krystal 15 Emulsion EF" by Kaufman

C. Evaporation Retarder: VOC-compliant, waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Aquafilm J74" by Dayton Superior
b. "Eucobar" by Euclid
c. "EVAPRE" by W.R. Meadows
d. "VaporAid" by Kaufman

D. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

1. As an alternative to burlap cloth, ASTM C 171-compliant, single-use, continuous-contact, moisture curing blankets, may be used. Acceptable products include, but are not limited to, the following:

a. "UltraCure" by McTech Group

1) Use "UltraCure NCF" for interior conditions.

2) Use “UltraCure SUN” for exterior conditions

E. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

F. Water: Potable.

2.13 SEALING MATERIALS

A. Concrete Sealer for all exterior flatwork shall be a VOC-compliant, clear, penetrating, silane-based, solution which will not discolor or alter the appearance of concrete.

1. Available Products: Subject to compliance with requirements, products which may be incorporated into the work include, but are not limited to, the following:

a. “Baracade Silane 100” by Euclid
b. “Weather Worker S-100 (J-29-A)” by Dayton Superior
c. “Pentreat 244-100” by W.R. Meadows

2.14 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C 109.

2.15 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 8139, lightweight, semi-rigid, closed-cell polypropylene foam plank, compliant with ASTM D 1751 for extrusion and compression

recovery and water absorption as tested per ASTM D 545. See Drawings for thickness. Joint filler depth to match slab thickness.

B. Bond Breaker Strips: ASTM D4869 30-lb roofing felt. Depth (height) of strip to match slab thickness. Use for all isolation joints at perimeter of basement walls, unless noted otherwise.

C. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.

2.16 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both. Concrete mix designs shall conform to the requirements of ACI 301, including, but not limited to the following:

1. Mix designs based on field strength test records:

a. If there are 15 or more consecutive field strength test records for the specified class of concrete, or within 1,000 psi of the specified class, within the time limits specified in ACI 301, the sample standard deviation shall be calculated and the "required average compression strength" shall be determined as specified in ACI 301. If the average of all test results is greater than the "required average compression strength", the concrete mix proportions can be determined from the proportions of the samples used for the field strength records.

1) Tests must have been performed within the past 12 months and must span a period of at least 60 days.

b. If there are 10 or more consecutive field strength test records using similar materials, within the time limits specified in ACI 301, the "required average compression strength" shall be determined from Table 4.2.3.3.b specified in ACI 301. If the average of all test results is greater than the "required average compression strength", the concrete mix proportions can be determined from the proportions of the samples used for the field strength records.

1) Tests must have been performed within the past 24 months and span a period of at least 60 days.

2. Mix designs based on laboratory trial mixture test data:

a. If a sufficient number of qualifying field strength test records are not available that meet the "required average compression strength", the concrete mix proportions shall be determined by laboratory trial mixture test data, as specified in ACI 301. The "required average compression strength" shall be determined from Table 4.2.3.3.b specified in ACI 301.
b. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
c. Tests must have been performed within the past 24 months.

B. Cementitious Materials:

1. Use cementitious materials of the same brand and type and from the same manufacturing plant as those used in establishing the concrete mix design.
2. Fly ash or slag cement may be used as needed to reduce the total amount of Portland cement, which would otherwise be used, by not more than 15 percent. Notify concrete floor finishers of floor slab concrete containing fly ash or slag cement.

    a. Exception: Do not use fly ash or slag cement in any concrete mixtures for exterior flatwork or infill slabs in existing buildings that will have moisture-sensitive floor finishes applied to the concrete.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Use aggregates from the same source and of the same size range as those used in establishing the concrete mix design.

E. Admixtures: Use admixtures of the same brand and type as those used in establishing the concrete mix design. Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting and/or integral crystalline waterproofing admixture in concrete mixtures where indicated.
5. Use air-entraining admixture in exterior exposed concrete and concrete exposed to freezing temperatures during construction. See “Concrete Mixtures for Building Elements” paragraph for air content requirements.
6. At Contractor’s option, a strength-accelerating admixture may be used to assist in complying with cold-weather concreting procedures.

F. Fiber Reinforced Concrete: Reinforce all exposed (no specified floor covering) concrete slabs on grade, bonded concrete topping, plank topping, stair fill, and elsewhere as noted with fiber reinforcement.

1. Introduce fibers at concrete batch plant with coarse and fine aggregate or at site in ready-mix concrete trucks prior to final on-site mixing of at least ten minutes.
2. Add fibers at a rate of 1.5 pounds per cubic yard of concrete. Maintain maximum water/cement ratio without adding additional water to compensate for any apparent loss of workability.

2.17 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. Concrete containing fly ash or slag cement must achieve stated compressive strength by 56 days.

Mix Label	Use	Minimum 28-Day Compressive Strength, psi	Exposure Class	Maximum Aggregate Size	Maximum Water/ Cement Ratio	Air Content ±1.5% at Delivery
STR301	Footings Below Frost Line	3,000	F0	1-1/2”	0.55	-
STR402	Interior Concrete Column Reinforcing	4,000	F0	1-1/2”	0.50	-
STR452	Exterior Foundation Walls	4,500	F2	1-1/2”	0.45	5.5
STR403	Bonded Concrete Topping	4,000	F0	1/2”	0.45	-
STR501	Exterior Reinforced Concrete Slab on Grade and Stairs Exposed to De-Icing Chemicals	5,000	F3 / C2	1-1/2”	0.40	5.5

B. Shrinkage Control: Provide a concrete mix that minimizes shrinkage.

1. Aggregate Size: Provide the largest size of aggregates practical within the gradation limits referenced above.
2. Provide a blended gradation to minimize the cementitious content.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant at no additional cost to Owner and as accepted by the Structural Engineer of Record. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Structural Engineer of Record before using in work.

D. Self-Consolidating Concrete (SCC)

1. Slump flow shall be measured in accordance with ASTM C 1611.
2. The Visual Stability Index (VSI) per ASTM C 1611 shall not exceed 1.
3. The difference between slump flow and J-Ring flow (as measured in accordance with ASTM C 1621) shall not be more than 2 inches.
4. The stability of the SCC shall be determined in the laboratory (in accordance with ASTM C 1610) prior to approval of the SCC mixture. SCC mixtures shall have a maximum static segregation (Segregation Factor) of 15 percent.

E. Slump Limits for non-SCC: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Typical Concrete (all concrete unless noted otherwise below): 4” maximum, except that when a plasticizing or high-range water-reducing admixture is added to increase the slump of a concrete proportioned to a slump of 2” to 4” without the admixture the maximum slump shall be 8” at the point of placement.

2.18 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
2. Remove excess water and debris from trucks before batching. Account for wash water remaining in truck, per ASTM C 94, in measurement of water per batch or completely empty truck drum of wash water prior to adding batch materials to truck.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials and vapor barriers with placement of forms and reinforcing steel.

3.2 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

K. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

L. Retighten forms and bracing after placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.3 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances of AISC 303 “Code of Standard Practice for Steel Buildings and Bridges.”
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.4 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Formwork supporting weight of concrete may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 VAPOR BARRIER INSTALLATION

A. Sheet Vapor Barrier: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

B. Following leveling and tamping of subbase for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of concrete placement.

C. Lap joints 6 inches and seal with manufacturer's recommended tape.

D. Provide vapor barrier where specified and at all slabs on grade scheduled to receive subsequent applied finishes.

E. All penetrations (pipes, rebar, piles, etc.) and damaged areas (punctures, cuts, etc.) through vapor barrier must be sealed. Follow vapor barrier manufacturer’s recommendation for sealing penetrations.

F. Extend vapor barrier a minimum of 4 inches up vertical surfaces, such as walls and columns, at edges of slabs. Tape top edge of vapor barrier to secure in place during concrete placement. Provide sealant between edge of slab and vertical surface above top edge of turned-up vapor barrier.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor barrier during reinforcement placement and concreting operations. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Splices: Comply with ACI 318.

1. All splices shall be considered Class B unless noted otherwise.
2. See Drawings for lap splice schedule.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets as indicated below, unless noted otherwise. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire. Flip mesh sheets and nest wires in thin concrete to prevent stacking mesh at corners of sheets.

1. For wire size (W) up to 4.0 (0.225 inch diameter, 4 gauge wire):

a. Minimum lap length shall be the wire spacing plus two inches

2. Unless noted or detailed otherwise, reinforce metal pan stair treads and landings with fibers and 2x2-w1.4-w1.4 welded wire reinforcement. Position reinforcement at mid-depth.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete; accepted bulkheads designed for this purpose may be used for slabs.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. The maximum length of any section of slab placed monolithically, without formed construction joints or metal shear key bulkheads, shall be 75 feet in any direction. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Cast fresh concrete against hardened concrete only after the surface of the hardened concrete has been prepared as indicated and wetted to the saturated-surface-dry condition.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide by 1/4 slab depth joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Complete sawing within 12 hours after placement. If an alternate method, timing, or depth is proposed for saw cutting, submit detailed procedure plans for review and acceptance.
3. At the Contractor's option, form contraction joints in unexposed floor slabs by saw cuts using the "Soff-Cut System" during the initial set stage at each joint location as soon as the slab will support the weight of saw and operator without disturbing the finish. Cut depth not less than the largest size aggregate with a 1-inch minimum. Protect cross cuts with Soff-Cut Joint Protector.
4. If joint pattern is not shown on Drawings, space contraction joints in evenly spaced grid patterns as follows:

    a. Slabs reinforced with bars or welded-wire-reinforcement: maximum 20 foot by 20 foot grid.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

    a. Where a sealant joint is indicated, terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07, are indicated.

2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Contraction (Control) Joints in Walls: Construct contraction joints per detail on Drawings. Locate joints at a 30-foot maximum spacing. Coordinate with veneer control or expansion joints where possible.

F. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

A. Flexible PVC Waterstops: Provide waterstops in wall construction and control joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions. All waterstop splices and intersections shall be fused for continuity of protection.

B. Bentonite Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 BONDED CONCRETE TOPPING

A. General:

1. See architectural drawings for locations and extent of concrete topping.
2. Concrete topping must be at least two inches in thickness. If thickness is less than two inches, use a self-leveling cement-based repair underlayment or repair overlayment material, whichever is applicable, as described in PART 2 of this specification.

B. Surface Preparation:

1. Remove existing floor finish in accordance with architectural drawings.
2. Prepare existing concrete substrate to ICRI CSP-7 or rougher condition.
3. Remove all contaminants that may interfere with bonding of concrete topping.
4. Sweep and vacuum substrate to remove all dust and debris.
5. Identify and mark existing control and construction joints in slab.
6. Saturate substrate to provide a saturated-surface-dry condition immediately prior to applying bonding slurry.

C. Bonding Slurry Coat:

1. Immediately before placing the concrete topping apply a bonding slurry coat of topping mix to the saturated-surface-dry substrate using a stiff bristle brush. Scrub the slurry into all pores of the substrate.
2. Do not allow bonding slurry coat to dry prior to placing topping.
3. If topping is specified to be reinforced with steel bars or wire reinforcement, sequence work to allow sufficient time to install reinforcement, in specified position utilizing appropriate supports, prior to slurry coating drying out prior to placing topping.

D. Topping:

1. While slurry coat is still wet, place the topping material in accordance with PART 3 of this specification.
2. Finish the topping in accordance with PART 3 of this specification.
3. Cure the topping in accordance with PART 3 of this specification.
4. Provide control joints in topping along locations of existing joints in substrate.

3.10 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Apply temporary protective covering to lower 2 feet of finished walls adjacent to cast-in-place floor slabs and similar conditions and guard against spattering during placement.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
2. Do not exceed specified water-cementitious materials ratio.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

    a. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
    b. Consolidation is typically not necessary for SCC. However, the Contractor shall have internal vibrators as recommended in ACI 301 on site in case internal vibration is needed due to delays in placement or the concrete has a lower than expected slump flow and has to be placed to prevent the formation of a cold joint.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Use special precautions in placement of concrete slabs on metal deck and ground to prevent excessive shrinkage, cracking, and slab curl. Slump limitations, timing of concrete placement with regard to atmospheric conditions, and curing are several but not necessarily all of the requirements that shall be met. If curling and/or shrinkage cracks should develop, the contractor shall correct the condition, including grinding, at his own expense.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Slope surfaces uniformly to drains where required.
6. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
7. Place sloped slabs beginning at the lowest elevation and proceed to the highest elevation.

E. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures. Work shall conform to all requirements of ACI 306.1, except as modified by the requirements of these Contract Documents.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F, and not more than 80 deg F at point of placement
2. Use only materials that are not frozen and do not contain ice or snow. Place concrete on unfrozen subgrade or on subgrade containing unfrozen materials.
3. Calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators are not permitted unless otherwise accepted in mix designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.11 FINISHING FORMED SURFACES

A. General: Remove all ties and patch holes, including those below grade.

B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

D. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process. Troweled on cement plaster coating prohibited.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.12 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Bleedwater may be delayed in slabs containing fly ash or slag cement. Notify floor finishers of all concrete slabs containing fly ash or slag cement.

B. Trowel Finish:

1. Apply a trowel finish to surfaces indicated exposed to view, to receive a fine-broom finish, or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. After floating, begin first trowel finish operation by hand or using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch. Meet and match existing slab surface where applicable.

C. Broom Finish:

1. Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
2. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.13 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.14 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Prevent construction vehicle traffic from traveling on concrete slabs until curing is complete and concrete has achieved its 28-day design compressive strength. Scissor lifts and similar personnel hoists may be used on slabs only after concrete has achieved at least 75 percent of its 28-day compressive strength.

C. Begin curing procedures before concrete surface has dried. Continue curing for not less than 7 days. Avoid rapid drying at end of final curing period.

D. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pounds per square foot per hour before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

E. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period with methods specified below, as applicable.

F. Unformed Surfaces (Interior Concrete): Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Do not use this curing method if a moisture-sensitive floor covering will be provided. Keep surfaces continuously moist for not less than 7 days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet.

        1) Burlap cloth: Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
        2) Single-use, continuous-contact blankets: Apply and maintain in accordance with manufacturer’s written instructions.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering or application of penetrating floor hardeners or sealers.

G. Unformed Surfaces (Exterior Concrete): Begin curing immediately after finishing concrete. Cure unformed exterior surfaces, including slabs, sidewalks, ramps, stairs and other surfaces. Cure exterior concrete according to ACI 308.1, by application of a curing compound, followed immediately by a minimum 7 day moisture cure.

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions within two hours of final finishing.

2. Moisture Curing: As described above.

3.15 SEALING

A. Concrete Sealer: Apply sealer to exposed exterior flatwork and stairs. Apply no sooner than 28 days after placement to clean, dry concrete free of oil, dirt, and other foreign material. Remove all residue from applied curing compound. Apply sealing material in accordance with sealer manufacturer's written application instructions.

3.16 JOINT FILLING

A. Defer joint filling until concrete has aged at least 28 days. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. In areas to be covered with finish floor materials, fill all joints with 1:1 sand cement grout and trowel smooth. After grout has cured, grind surface flush with adjoining surfaces.

D. In areas where slab is exposed, install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Follow manufacturer's installation instructions. Overfill joint and trim joint filler flush with top of joint after hardening.

E. In areas where slab is exposed, provide joint sealant. Joint sealant material is specified in Division 07.

3.17 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 1/2 inch at perimeter of repair area. Use as few cuts as possible, keeping angles at least 90 degrees with no re-entrant (inside) corners. Make edges of cuts perpendicular to concrete surface. Chip concrete within perimeter to solid concrete and provide an exposed aggregate surface condition complying with ICRI CSP-6 or rougher. Flush repair area with clean water and allow to dry to saturated-surface-dry condition. Place, compact, and finish to blend with adjacent finished concrete. Cure patch area in accordance with procedures specified for unformed cast-in-place concrete.
2. Fill form-tie voids with patching mortar or cone plugs secured in place with plug manufacturer's recommended bonding agent.

3. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
4. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas, whether caused by finishing process or slab curl, by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Use as few cuts as possible, keeping angles at least 90 degrees with no re-entrant (inside) corners. Make edges of cuts perpendicular to concrete surface. Chip concrete within perimeter to solid concrete and provide an exposed aggregate surface condition complying with ICRI CSP-6 or rougher. Flush repair area with clean water and allow to dry to saturated-surface-dry condition. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Flush repair area with clean water and allow to dry to saturated-surface-dry condition. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Perform structural repairs of concrete as directed by Structural Engineer of Record.

F. Repair materials and installation not specified above may be used, subject to the Structural Engineer of Record’s approval.

3.18 FIELD QUALITY CONTROL

A. Correct deficiencies in Work that Section 014533 “Special Inspection and Testing” reports and inspections indicate do not comply with the Contract Documents. Costs for correcting Work and any re-testing that may be necessary shall be at the Contractor’s expense.

3.19 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.

B. Related Requirements:

1. Section 093013 “Tiling” for thin-set floor tile requiring hydraulic cement underlayment. to be installed over existing above-grade concrete floor slab.

2. Section 096513” Resilient Tile Flooring” for LVT and VCT requiring hydraulic cement underlayment to be installed over existing above-grade concrete floor slab. See drawings for FRP reinforcing strips locations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.

2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. IIC-Rated Assemblies: For IIC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E492 and classified according to ASTM E989 by an independent testing agency.

2.2 HYDRAULIC CEMENT UNDERLAYMENTS - AT DEPRESSED SLAB LOCATIONS AS INFILL (Thick)

A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum average uniform thickness of 1” - 2”, as indicated on Drawings, and that can be feathered at edges to match adjacent floor elevations. Product to be rated to up to 3” thickness.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **SCHONOX US** or comparable product:

a. Maxxon – Level Right

2. Cement Binder: ASTM C150/C150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.

3. Compressive Strength: Not less than **4000 psi (27.6 MPa)** at 28 days when tested according to ASTM C109/C109M.

4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated. Basis of design primer, **SCHONOX VD**

1. VOC Content: Provide coating with VOC content of 100 g/L or less.

2. Low-Emitting Materials: Coating shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.

1. VOC Content: Provide coating with VOC content of 100 g/L or less.

2. Low-Emitting Materials: Coating shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

2.3 HYDRAULIC CEMENT UNDERLAYMENTS - SELF LEVELER (Thin)

A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4” and that can be feathered at edges to match adjacent floor elevations.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **SCHONOX ZM** or comparable product as determined by architect by the following:

a. Maxxon – Level Right

2. Cement Binder: ASTM C150/C150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.

3. Compressive Strength: Not less than **5,500 psi (27.6 MPa)** at 28 days when tested according to ASTM C109/C109M.

4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

C. Install self-leveler over entire flooring surface to receive new floor finish.

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated. Basis of design primer, **SCHONOX VD**

1. VOC Content: Provide coating with VOC content of 100 g/L or less.

2. Low-Emitting Materials: Coating shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

2.4 ACCESSORIES

A. Reinforcement fabric for use to span joints, including but not limited to joints between new concrete pours, depressed slab infill locations, and existing concrete slabs. Install continuous 18” strip of reinforcement fabric centered over joints.

B. PRODUCTS:

1. Basis of design, **SCHONOX RENOTEX** fiber fabric.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.

2. Fill substrate voids to prevent underlayment from leaking.

3. **Shot blast substrate to a CSP of 3**.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform tests so that each test area does not exceed **1000 sq. ft. (304.8 sq. m)** and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum **85** percent relative humidity

level measurement, or as recommended by hydraulic cement underlayment manufacturer.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.

2. Coordinate application of components to provide optimum adhesion to substrate and between coats.

3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to product surface.

2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

SECTION 042000 - UNIT MASONRY

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes (for cutting and patching of existing exterior or interior walls):

1. Concrete masonry units.
2. Face brick to match existing.
3. Mortar and grout.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for furnishing steel lintels for unit masonry.
2. Division 07 Section “Performed Joint Seals” for sealing control joints in unit masonry.
3. Division 07 Section “Thermal Insulation” for cavity wall insulation.
4. Division 07 Section “Fluid Applied Air Barrier” for wall air barrier systems.

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths of masonry (f'm):

1. For concrete unit masonry as follows: f’m = 2000 psi.
2. For brick unit masonry as follows: f’m = 1500 psi

1.4 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Detail drawings for special masonry work: Submit for approval, detail drawings indicating layout of masonry work, wherever special masonry units and special configurations (other than standard straight line and 90-degree work) are required in masonry work.

C. Samples for Initial Selection:

1. Face brick to match existing.

D. Samples for Verification: For each type and color of the following:

1. Face brick**,** in the form of straps of five or more bricks.

2. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties and material test reports substantiating compliance with requirements.

b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.

c. For exposed brick, include test report for efflorescence according to ASTM C 67.

2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

3. Grout mixes. Include description of type and proportions of ingredients.

4. Joint reinforcement.

5. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.

1. Build sample panels for typical interior wall in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high.

2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.

3. Clean one-half of exposed faces of panels with masonry cleaner indicated.

4. Protect approved sample panels from the elements with weather-resistant membrane.

5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

   a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.

2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

2.0 PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. Provide bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Density Classification: Normal weight.

2. Minimum Equivalent Thickness: For walls required to have 1- or 2-hour fire rating manufacturer shall provide the following:

   a. Certification of the aggregates from which the fire rated CMU are produced.

   b. Certification of the equivalent thickness of each rated CMU.

3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and mortar.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

   a. Integral Water Repellent CMU shall comply with the spray bar performance criteria of the National Concrete Masonry Association 'Tek 19-7' Characteristics of Concrete Masonry Units with Integral Water Repellent.

   b. Products: Subject to compliance with requirements, provide one of the following:

      1) ACM Chemistries; RainBloc.

      2) BASF Aktiengesellschaft; Rheopel Plus.

      3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

2. All Integral Water Repellent CMU delivered to the jobsite shall be labeled as Integral Water Repellent Units.

2.3 BRICK

A. General: Comply with the following requirements applicable to each form of brick required:

1. Provide special molded shapes where indicated and as follows:

   a. For applications requiring brick of form, color, texture, and size on

exposed surfaces that cannot be produced by sawing standard brick sizes.

b. For applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

c. For applications where stretcher units cannot accommodate special conditions including those at corners, movement joints, bond beams, sashes, and lintels.

2. Provide units without cores or frogs and with all exposed surfaces finished for ends of sills, caps, and similar applications that expose brick surfaces that otherwise would be concealed from view.

B. Face Brick Standard: ASTM C 216 and as follows:

1. Grade and Unit Compressive Strength: Provide units of grade and minimum average net area compressive strength indicated below:

a. Grade SW (Severe Weathering).

b. Not less than the unit compressive strengths required to produce clay masonry construction of compressive strength of masonry indicated.

2. Initial Rate of Absorption: Between 5 and 20 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67.

3. Salt-free composition; provide manufacturer's certification. Include material test report for efflorescence according to ASTM C-2.

4. Type FBS (normal size and color variations for general use in exposed masonry permitting wider variations in size and color ranges than Type FBX).

5. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 8 inches long. Verify existing brick sizes where indicated to match existing.

a. Available product: Provide custom blend to match existing color, surface, texture, and size to match existing brick for the where indicated.

1) The Bowerstone shale company with custom blend mix to match existing or Architect approved equal.

b. Application: Use where indicated on drawings.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II. Provide natural color.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and Type S hydrated lime complying with ASTM C 207.

1. For matching existing pigmented mortars, use colored Portland cement-lime mix of formulation required to produce matching color. Pigments shall not exceed 10 percent of Portland cement by weight for mineral oxides nor 2 percent for carbon black.

2. Use permitted only when authorized in writing by Architect.

3. Masonry cements are not permitted.

D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

E. Aggregate for Grout: ASTM C404.

F. Water: Potable.

G. Waterproofing: Integral waterproofing equal to “Dry Block” or "Hydrocide Powder" by Sonneborne. Add integral waterproofing to mortar used in exterior walls. Manufacturer's recommendations shall be followed.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60, deformed bars.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Hot-dip galvanized, carbon steel.

2. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.

3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.

4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.

5. Provide in lengths of not less than 10 feet (3 m).

2.6 THROUGH (“THRU”) WALL FLASHING

A. Two Piece Receiver and Counter Flashing:

1. Material: 16 oz Copper

2. Receiver: Mechanically Keyed at 3” intervals with vertical locking slot receiver for counterflashing. Provide a minimum of 2 inch up turned leg at backup wall.

3. Provide pre-manufactured mechanically keyed end dams, inside and outside corners.

4. Counter Flashing: 16 oz. copper sheet fabricated per drawing requirements.

a. All formed flashings and counter flashings shall be fabricated with interlocking bayoneted style lap joints that allow for thermal movement. Fabricated separate inside and outside corner pieces.

B. Drip Edge Metal Flashing:

1. Preformed stainless steel, 0.0188" (26 ga.) minimum, Type 316.

2. Length: Single piece, 12 inches longer than masonry opening.

3. Drip edge "hemmed".

4. Width: 2"

5. Compressible filler adhered to bottom surface, adhesive strip with release paper adhered to top surface.

6. Manufacturer: Hohmann & Barnard FTSA (provide end dams) or equal.

7. Related Components: Laminated flashing shall be used in conjunction with performed metal as through-wall component. The laminated flashing shall drape down over the upstanding leg and across to the front edge of the outstanding leg of the lintel.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.

2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

3. Stainless-Steel Bars: ASTM A 276 or ASTM a 666, Type 316.

B. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from steel sheet, galvanized after fabrication 0.060-inch-(1.52-mm-) thick.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, stainless-steel wire

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.187-inch- (4.76-mm-) diameter, stainless-steel wire.

2.8 ADJUSTABLE MASONRY VENEER ANCHORS

A. General: Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it; for attachment over cmu masonry backup; and with the following structural performance characteristics:

1. Structural Performance Characteristics: Capable of withstanding a 100 lb. load in either tension or compression without deforming over, or developing play in excess of, 0.05 inch.

B. Screw-Attached Masonry Veneer Anchors: Stainless steel units consisting of wire tie section and metal anchor section complying with the following requirements:

1. Wire Tie Shape: Triangular (Vee Wall Tie) or box type, with #370 seismic clip.

a. Wire diameter: 0.1875 inches.

b. Material: Stainless Steel, Type 316

2. Wire Tie Length: As required to extend 1-1/2 inches into masonry wythe of veneer face.

3. Available Products: Subject to compliance with requirements, weep hole/ventilators that may be incorporated in the Work include, but are not limited to, the following:

a. Hohmann & Barnard, Inc.; 2-SEAL BYNA-LOK WIRE TIE.

b. Or Architect approved equal.

4. Anchor Section: Screw-attached, masonry-veneer anchors with a corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has a spacer (barrel) that seats directly against cmu backup in same thickness as insulation and has an epdm gasketed washer head bonded to barrel that seals the insulation and air/vapor barrier.

a. Type 304 stainless steel barrel with a polymer coated screw.

b. Barrel to match insulation thickness.

c. Available Products: Subject to compliance with requirements, weep hole/ventilators that may be incorporated in the Work include, but are not limited to, the following:

1) Hohmann & Barnard, Inc.; Thermal Concrete 2-Seal Tie.

2) Or Architect approved equal.

2.9 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

C. Post installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 unless otherwise indicated.

3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weeps: Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymner, full height and width of head joint and depth 1/8” less than depth of outer wythe, in color selected from manufacturer’s standard.

1. Available Products: Subject to compliance with requirements, weep hole/ventilators that may be incorporated in the Work include, but are not limited to, the following:

2. Weeps: “QV-Quadro-Vent by Hohmann & Barnard, Inc.

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.

b. EaCo Chem, Inc.

c. ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

2. Use portland cement-lime mortar unless otherwise indicated.

3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Clay Face Brick:

1. ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime. Sand gradation is to match the existing. Add mortar pigments to produce mortar colors required to match existing.

2. Mortar Proportions: One-part portland cement, one-part lime, and six-parts well graded sand. Sand gradation is to match the existing.

3. Trial Mix: Prepare trial mixes of pointing mortars.

4. Trial mixes shall be tested and adjusted to arrive at proper mix that provides color match, an air content of 12 percent to 14 percent, and a compressive strength of 1,500 psi to 1,800 psi.

D. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For reinforced masonry, use Type S.

2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

3. For interior non-load-bearing partitions, Type O may be used instead of Type N.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.

2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).

3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

2. Verify that foundations are within tolerances specified.

3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).

2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).

B. Lines and Levels:

1. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.

2. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12 mm) maximum.

3. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.

4. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12 mm) maximum.

5. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12 mm) maximum.

6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond and stack bond at glazed masonry units; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.

2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.

3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.

2. Embed connector sections and continuous wire in masonry joints.

3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

4. Space anchors as indicated, but not more than 16 inches (458 mm) o.c. vertically and 16 inches (458 mm) o.c. horizontally, with not less than 1 anchor for each 1.7 sq. ft. (0.17 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around perimeter.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Install preformed control-joint gaskets designed to fit standard sash block.

2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting

1. General

a. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure. Install shores and bracing, if required, before starting grouting operations.

b. Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

c. Use "Fine Grout" or “Coarse Grout” per ASTM C 476 in accordance with Table 7 of TMS 602/ACI 530.1/ASCE 6.

d. At Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements that follow.

e. Place grout within 1-1/2 hours from introducing water in the mixture and prior to initial set.

f. Place and consolidate grout without displacing reinforcing.

g. Vibrate each grout lift during pouring operation.

2. Grout Pours and Lifts

a. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation.

b. Grout pours are comprised of one or more grout lifts placed in succession.

c. Maximum grout pour height: 24 feet, subject to restrictions for given in Table 7 of ACI 530.1 for grout type and dimensions of spaces to be grouted.

d. Maximum grout lift height:

1) Subject to restrictions for given in Table 7 of ACI 530.1 for grout type and dimensions of spaces to be grouted, the maximum grout lift height shall be 12 feet 8 inches when masonry has cured for at least 4 hours, grout slump is maintained between 10 and 11 inches at point of placement, and there are no bond beams between the top and bottom of the pour height.

2) Subject to restrictions for given in Table 7 of ACI 530.1 for grout type and dimensions of spaces to be grouted, the maximum grout lift height shall be 5 feet 4 inches when masonry has cured for less than 4 hours, or the grout slump is not maintained between 10 and 11 inches at point of placement.

e. Cleanouts: Cleanouts are required for grout lift heights exceeding 5 feet four inches. Provide cleanout holes in first course at all vertical cells which are to be reinforced and grouted. In solid-grouted masonry, space cleanouts a maximum of 32 inches on center. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell, or use clear plastic window such as made by Smart Masonry Systems to cover clean-out opening.

f. Grout key: Form grout keys between grout pours and between grout lifts when the first lift is permitted to set more than one hour prior to the placement of the subsequent lift.

a. Form grout keys by terminating the grout 1-1/2 inches to 4 inches below a mortar joint. Do not form grout keys within beams or reinforced masonry lintels. At bond beams or at reinforced masonry lintels laid with closed bottom units, terminate the grout pour at the bottom of the beam or lintel without forming a key.

g. Place grout in lintels or beams over openings in one continuous pour.

3. Consolidation

a. Consolidate grout at time of placement.

b. Consolidate grout pours 12 inches or less in height by mechanical vibration or puddling.

c. Consolidate grout pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred. Use a low velocity vibrator with a 3/4-inch head. Activate the vibrator for one to two seconds in each grouted cell.

4. Bond Beams: Stop grout in vertical cells 1-1/2 inches below bond beam course. Place grout in bond beam course before filling vertical cores above bond beam.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

8. Clean stone trim to comply with stone supplier's written instructions.

9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Extent of structural steel work is shown on Drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Furnish steel anchor rods, steel bearing and leveling plates, steel lintels, masonry partition top anchors, and other items indicated on Drawings to be furnished by the structural steel fabricator and installed by other contractors.

C. Provide shop painting and field touchup.

D. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components which do not comply.

E. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

F. Related Sections:

1. Division 01 Section "Special Inspection and Testing."
2. Division 03 Section “Cast-In-Place Concrete.”
3. Division 05 Section "Steel Decking."
4. Division 05 Section “Steel Joist Framing.”
5. Division 05 Section “Welded Steel Gratings.”
6. Division 09 painting Sections for finish painting requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1.5 SUBMITTALS

A. Shop Drawings: Show fabrication of structural-steel components and erection drawings showing assembly of components with piece marks clearly noted.

1. Reproduction of Contract Drawings for use as shop drawings is not permitted.
2. Submit electronic fabrication shop drawings in Portable Document Format to plot on a minimum size of 22 inches by 34 inches. Contractor is responsible for making hard copies of reviewed shop drawings and distributing them to sub-contractors.
3. AutoCAD and/or Revit Structure files of structural drawings will be available for use subject to acceptance of a Disclaimer.
4. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
5. Include embedment drawings.
6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
8. Shop paint.
9. For structural-steel connections indicated to comply with design loads, include structural analysis data.
10. Contractor shall leave a 3-inch high by 4-inch wide blank space in the title block or on the cover page in which the review stamp will be placed.

B. Qualification Data: Submit certification for AISC-Certified Plant, Category BU. See paragraph 1.6-A-1 for fabricators that are not AISC certified.

C. Product Test Reports or Product Data for the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Post-Installed anchors.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

D. Welding Certificates: Welders must be AWS-certified for weld types and positions required.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

F. Mill test reports for structural steel, including chemical and physical properties.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU.

1. Fabricators without specified AISC certification may provide structural steel framing for the project, however shop inspections, performed in accordance with Section 014533 - "Special Inspection and Testing" and the Statement of Special Inspections, will be required. If the Contractor intends to utilize a fabricator that is not approved for fabricating components in their shop without shop special inspections and/or testing by the Special Inspector, the Contractor must request and receive approval from the Design Professional in Responsible Charge (DPIRC) and Building Official (BO) prior to engaging the fabricator. Contractor shall reimburse Owner for all added special inspection and testing costs for shop inspections of fabricators without specified AISC certification.

B. Comply with applicable provisions of the following specifications and documents:

1. AISC 303 – 2016, "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC 360 – 2016, "Specification for Structural Steel Buildings."
3. AWS D1.1 – 2015, "Structural Welding Code – Steel."
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts", 2014 Edition.
5. Uniform Code of New York State, 2020.

C. Preinstallation Meeting

1. Convene a preinstallation meeting with the Owner's representative, Contractor's representative, Structural Steel Fabricator's representative, Structural Steel Erector's representative, Special Inspector / testing laboratory, and the Architect and Engineer a minimum of two weeks prior to erection of steel framing,
2. Topics to be reviewed may include, but not be limited to, demolition work, review of special inspection and testing requirements, strength of concrete and masonry elements supporting structural steel, need for anchor bolt repairs, modifications, or replacement, site conditions, deliveries, laydown area, layout verifications, crane access and use, erection schedule, field welding requirements, coordination of floor and roof openings, connections to work of other trades (masonry walls, etc.) weather restrictions, temporary protection, status of shop/fabrication drawings, requests for information, fall protection, and safety.

D. Special Inspections: See Section 014533 - "Special Inspection and Testing" for a description of the special inspections and testing to be paid for by the Owner and for the extent of the Contractor's responsibilities with regard to the Special Inspections and Testing program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and sealing of containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating “twist-off” tension-control fasteners, and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. W-Shapes and WT-Shapes: ASTM A 992.

C. Channels, Angles, M, S-Shapes and ST-Shapes: ASTM A 36.

D. Plate and Bar: ASTM A 36.

E. Square and Rectangular Hollow Structural Sections: ASTM A 500, Grade B or C.

F. Steel Pipe: ASTM A 53, Type E, Grade B.

1. Weight Class: Standard unless noted otherwise on the drawings.

G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, or ASTM A 194, Grade 2H, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F 3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, or ASTM A194, Grade 2H, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers; all with plain finish.

D. Zinc-Coated Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers; all with galvanized finish.

E. Post-Installed Anchors:

1. Epoxy Adhesive for Anchorage to Concrete or Grouted Masonry: Two component, high solids, moisture tolerant structural epoxy adhesive conforming with ASTM C881. See Drawings for fastener materials and additional requirements.

    a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

        1) “HIT RE-500 V3” by Hilti
        2) “SET-3G” by Simpson Strong-Tie
        3) “AC200+” by DeWalt
        4) “Epcon G5” by ITW Red-Head
        5) “AnchorFix-3001” by Sika

2. Expansion Anchor for Anchorage to Concrete, Solid Masonry or Grouted Masonry: Carbon steel stud type, sized as shown, complying with ASTM A 510, zinc plated in accordance with ASTM B633. See Drawings for additional information.

    a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

        1) “Kwik Bolt 3” by Hilti
        2) “Power Stud” by DeWalt
        3) “Red-Head Trubolt” by ITW Red-Head
        4) “Wedge-All” by Simpson Strong-Tie

3. Screw Anchor for Anchorage Concrete, Solid Masonry or Grouted Masonry: Single-piece, fully-removable, zinc-plated carbon steel anchor with a hex-washer head. See Drawings for additional information.

a. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

1) "Kwik HUS-EZ" by Hilti
2) "Screw-Bolt+" by DeWalt
3) "Large Diameter Tapcon (LDT)" by ITW Red-Head
4) "Titen HD" by Simpson Strong-Tie

F. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

G. Unheaded Anchor Rods: ASTM F 1554, Grade 36**,** straight.

1. Nuts: ASTM A 563, Grade C**,** heavy-hex carbon steel.
2. Plate Washers: ASTM A 36 carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain, except use hot-dip zinc coating per ASTM A 153 for crawlspaces, boiler rooms, exterior exposure. and elsewhere where indicated.

2.3 PRIMER AND COATINGS

A. Shop Primer for Interior Structural Steel: High solids, rust-inhibitive alkyd primer intended for protection for a short period of exposure in ordinary atmospheric conditions.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. "Series V10" by Tnemec
b. "6100 System Shop Coat Primer" by Rust-Oleum
c. "Kem Bond HS Universal Metal Primer" by Sherwin Williams

B. Primer for High Performance Paint System for Structural Steel in Crawlspaces, Boiler Rooms, Exterior Conditions, and Elsewhere Where Indicated: See Division 09

C. Galvanizing Repair Paint: ASTM A 780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Masterflow 928" by BASF Building Systems
b. "SikaGrout 328" by Sika
c. "High Strength Grout" by Five-Star Products

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303 and 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Beam Copes: All re-entrant corners shall be shaped, notch free, to a radius of 1/2" minimum.

D. Connections: Weld or bolt shop connections using high-strength bolts in standard framed connections as shown in the AISC Steel Construction Manual. Minimum bolt size, 3/4" diameter, unless noted otherwise. Bolt field connections, except where welded connections or other connections are indicated. All connections shall be properly selected as bearing type connections for the moment or shears shown on the drawings or for the standard end loads of the members to be connected as tabulated for the uniform load in the AISC Manual. Provide for unusual end loads where shown.

E. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

F. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

G. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, “Hand Tool Cleaning” or SP 3, "Power Tool Cleaning."

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes

2.6 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize all steel in crawlspaces, boiler rooms, and lintel elements in exterior walls. Galvanize all exterior steel where not indicated to receive high-performance paint system.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, unless otherwise indicated on Drawings.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. Interior Steel: SSPC-SP 2, “Hand Tool Cleaning” or SP 3 "Power Tool Cleaning."
2. Exterior Exposed Steel to Receive High-performance Paint System: SSPC-SP 6, "Commercial Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions to provide a minimum dry film thickness of greater of 2 mils and primer manufacturer’s minimum recommended thickness. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

A. Correct deficiencies in Work that Section 014533 “Special Inspection and Testing” reports indicate do not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing, are in place unless otherwise indicated.

1. Remove temporary shoring supporting composite construction only after cast-in-place concrete has attained its 28-day design compressive strength.

3.3 ERECTION

A. Install structural framing on concrete piers, columns, or walls only after concrete has achieved at least 75 percent of its 28-day design compressive strength.

B. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Base, Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate where indicated.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Maintain erection tolerances of structural steel within AISC 303.

F. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will

be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

G. Splice members only where indicated.

H. Do not use thermal cutting during erection.

I. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

J. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

K. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug-tightened, unless otherwise indicated on Drawings.
2. Use galvanized fasteners when fastening galvanized steel, and elsewhere where indicated.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

C. Post-Installed Anchors: Install approved anchors in strict accordance with Drawings and anchor manufacturer’s installation instructions.

3.5 FIELD QUALITY CONTROL

A. Correct deficiencies in Work that Section 014533 “Special Inspection and Testing” reports and inspections indicate do not comply with the Contract Documents. Costs for correcting Work and any retesting that may be necessary shall be at the Contractor’s expense.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting for Shop-Primed Steel: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

C. Touchup Painting for Shop-Primed Steel to be Field-Painted: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 053100 – STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Dovetail-rib roof deck
3. Composite floor deck.

B. Extent of steel decking is indicated on Drawings, including basic layout and type of deck units required.

C. Related Sections:

1. Division 01 Section “Special Inspection and Testing.”
2. Division 03 Section "Cast-in-Place Concrete."
3. Division 05 Section "Structural Steel Framing."
4. Division 05 Section "Metal Fabrications."
5. Division 09 painting Sections for finish painting requirements.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated, submit manufacturer's specifications, installation instructions and applicable published literature for the structural properties of the proposed deck units. Include manufacturer’s certification as may be required to show compliance with these specifications.

B. Shop Drawings:

1. Submit detailed drawings showing layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
2. Submit electronic fabrication shop drawings in Portable Document Format (pdf) to plot on a minimum size of 22 inches by 34 inches. The title block shall include a blank space 4 inches wide by 3 inches high.
3. Reproduction of contract drawings for use as shop drawings is not permitted.
4. AutoCAD and/or Revit Structure files of structural drawings will be available for use subject to acceptance of a Disclaimer.
5. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

C. Welding Certificates: Welders must be AWS-certified for weld types and positions required.

D. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated fasteners.
2. Self-drilling screw fasteners.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel", 2008.

B. Special Inspections: See Section 014533 - "Special Inspection and Testing" for a description of the special inspection and testing to be paid for by the Owner and for the extent of the Contractor's responsibilities with regard to the Special Inspections and Testing program.

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. American Iron and Steel Institute (AISI) Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members", 2016.

B. Steel Deck Institute (SDI) Specifications. Comply with the following:

1. ANSI/SDI RD-2010 "Standard for Steel Roof Deck."
2. ANSI/SDI CD-2011 "Standard for Composite Steel Floor Deck – Slabs."
3. SDI COSP-2014 "Code of Standard Practice."
4. SDI Publication No. 31 "Design Manual for Composite Decks, Form Decks and Roof Decks",

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 MANUFACTURERS

A. Decking Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Steel Deck
2. Canam Buildings; Canam Group, Inc.
3. Epic Metal Corp.
4. James River Steel
5. New Millenium Building Systems; Steel Dynamics, Inc.
6. Vulcraft; Nucor Corp.
7. Wheeling Corrugating Co.

B. Mechanical Fasteners (power-actuated fasteners for fastening deck to supports): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hilti, Inc.
2. Pneutek, Inc.
3. Simpson Strong-Tie

C. Mechanical Fasteners (self-drilling screw fasteners for fastening deck to supports and fastening deck side laps): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hilti, Inc.
2. ITW Buildex
3. Simpson Strong-Tie

2.3 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with performance requirements above, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: Wide Rib, Type B.
3. Profile Depth: As indicated on Drawings.
4. Design Uncoated-Steel Thickness: As indicated on Drawings.
5. Span Condition: Triple span where possible.
6. Side Laps: Interlocking, for screw fastening.

2.4 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels to comply with performance requirements above, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 50, G60 zinc coating.

2. Deck Profile: As indicated on Drawings.
3. Profile Depth: As indicated on Drawings.
4. Design Uncoated-Steel Thickness: As indicated on Drawings.
5. Span Condition: Triple span or more where possible.
6. Side Laps: Interlocking, for screw fastening.

2.5 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners for Fastening Deck to Supports: Self-drilling screws or power-actuated fasteners may be used in lieu of welding to fasten decking to supports. Fasteners shall be corrosion-resistant carbon steel fasteners.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter. Length as required to provide a minimum of three exposed threads.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, not less than 20 gauge (0.0359 inch) uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops (screed angles): Steel sheet, of same material and finish as deck, and of thickness and profile as recommended by SDI Publication No. 31 for overhang and slab depth, unless otherwise indicated on Drawings, but not less than 14 gauge (0.0747 inch) uncoated thickness.

G. Girder Fillers: Steel sheet, of same material and finish as deck, and of thickness and profile as recommended by SDI Publication No. 31 for overhang and slab depth, unless otherwise indicated on Drawings.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

I. Flat Sump Plates: Single-piece steel sheet, not less than 14 gauge (0.0747 inch) uncoated thickness, of same material and finish as deck. For drains, cut holes in the field.

J. Galvanizing Repair Paint: ASTM A 780.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, final shop drawings, and requirements in this Section.

B. For decking that will be exposed to view in completed construction, do not use mechanical fasteners for attaching deck to supports if fasteners will completely penetrate support steel and be exposed.

C. Install temporary shoring before placing deck panels if required to meet deflection limitations.

D. Locate deck bundles to prevent overloading of supporting members.

E. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

F. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

G. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

H. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

I. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

J. Marking: Mark steel deck at the centerline of supporting steel members to prevent weld burn through or mechanical fastener punch through. Use a chalk line or indelible marker.

K. Cordon off the Controlled Decking Zone (CDZ) area and all areas below steel roof deck sheets being fastened during installation.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches on center at all supported edges and in field, unless noted otherwise on Drawings.

B. Fasten roof deck panels to steel supporting members by power-actuated fasteners as follows:

1. Power Verification: Gauge power-actuated tool systems to the base material steel type, steel deck type and thickness prior to final installation. Confirm appropriate power settings as required prior to final installation.
2. Fastener Type: As required for substrate thickness and diaphragm strength and stiffness requirements.

3. Fastener Placement: Install fasteners at least 3/8” from the flange tip or angle toe. Additionally, when fastening to joist top chord angles, install fasteners no more than 8 times the angle thickness from the heel of the angle. Accurately measure and mark fastener lines / locations on decking to ensure proper fastening to the support frame.
4. Fastener Spacing: Fasten edge and interior ribs of deck units with a minimum of two fasteners per deck unit at each support. Space fasteners as required for diaphragm strength and stiffness requirements, but not less than 12 inches on center at all supported edges and in field.

C. Fasten roof deck panels to steel supporting members by self-drilling screw fasteners as follows:

1. Fastener Type: Hexagonal washer head, No. 12 minimum diameter. Point size as required based on thickness of material to be drilled. Length as required to provide a minimum of three exposed threads.
2. Fastener Placement: Install fasteners at least 3/8” from the flange tip or angle toe. Additionally, when fastening to joist top chord angles, install fasteners no more than 8 times the angle thickness from the heel of the angle. Accurately measure and mark fastener lines / locations on decking to ensure proper fastening to the support frame.
3. Fastener Spacing: Fasten edge and interior ribs of deck units with a minimum of two fasteners per deck unit at each support. Space fasteners as required for diaphragm strength and stiffness requirements, but not less than 12 inches on center at all supported edges and in field.

D. Side-Lap Fastening: Mechanically-fasten side laps with No. 10 self-drilling screws at intervals not exceeding the lesser of 1/2 of the span or 36 inches, unless noted otherwise on Drawings.

E. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted, at Contractor's option.

F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.

G. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter:

a. 3/4 inch nominal for composite floor deck.

2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches on center at all supported edges and in field, unless noted otherwise on Drawings.

B. Fasten floor deck panels to steel supporting members by power-actuated fasteners as follows:

1. Power Verification: Gauge power-actuated tool systems to the base material steel type, steel deck type and thickness prior to final installation. Confirm appropriate power settings as required prior to final installation.
2. Fastener Type: As required for substrate thickness and diaphragm strength and stiffness requirements.
3. Fastener Placement: Install fasteners at least 3/8” from the flange tip or angle toe. Additionally, when fastening to joist top chord angles, install fasteners no more than 8 times the angle thickness from the heel of the angle. Accurately measure and mark fastener lines / locations on decking to ensure proper fastening to the support frame.
4. Fastener Spacing: Fasten edge and interior ribs of deck units with a minimum of two fasteners per deck unit at each support. Space fasteners as required for diaphragm strength and stiffness requirements, but not less than 12 inches on center at all supported edges and in field.

C. Fasten floor deck panels to steel supporting members by self-drilling screw fasteners as follows:

1. Fastener Type: Hexagonal washer head, No. 12 minimum diameter. Point size as required based on thickness of material to be drilled. Length as required to provide a minimum of three exposed threads.
2. Fastener Placement: Install fasteners at least 3/8” from the flange tip or angle toe. Additionally, when fastening to joist top chord angles, install fasteners no more than 8 times the angle thickness from the heel of the angle. Accurately measure and mark fastener lines / locations on decking to ensure proper fastening to the support frame.
3. Fastener Spacing: Fasten edge and interior ribs of deck units with a minimum of two fasteners per deck unit at each support. Space fasteners as required for diaphragm strength and stiffness requirements, but not less than 12 inches on center at all supported edges and in field.

D. Side-Lap Fastening: Mechanically-fasten side laps with No. 10 self-drilling screws at intervals not exceeding the lesser of 1/2 of the span or 36 inches, unless noted otherwise on Drawings.

E. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted, at Contractor's option.

F. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

G. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Correct deficiencies in work that “Special Inspection and Testing” reports and inspections indicate do not comply with the Contract Documents. Costs for correcting Work and any retesting that may be necessary shall be at the Contractor’s expense.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Soffits

B. Related Requirements:

1. Section 014533 “Special Inspection and Testing”
2. Section 051200 “Structural Steel Framing”
3. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
4. Section 092216 "Non-structural metal framing" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips and tracks.
6. Miscellaneous structural clips and accessories.

E. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

E. Installer Qualifications: An experienced installer who has completed structural cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

F. Special Inspections: See Section 014533 – “Special Inspection and Testing” for a description of the special inspection and testing to be paid for by the Owner and for the extent of the Contractor’s responsibilities with regard to the Special Inspection and Testing program.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Acceptable manufacturers include, but are not limited to, the following:

1. ClarkDietrich building Systems.
2. MarinoWARE
3. Craco Manufacturing, Inc.
4. SuperStud Building Products, Inc.
5. The Steel Network, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads:

a. Exterior Walls and Ceilings / Soffits Subject to Wind Loads: See Structural Drawings for Wind Component and Cladding Wind Pressures.
b. Dead Loads for Exterior Wall Construction, Ceilings / Soffits: 15 psf (unfactored) for walls, ceilings and soffits clad with metal panel finish.

2. Deflection Limits: Design framing systems to withstand design loads without deflections (lateral deflection for wall studs, vertical deflection for soffit framing) greater than:

a. L/360 for framing supporting non-brittle finishes.
b. L/600 for framing supporting brittle finishes (brick, stone, tile and similar).

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4 inch.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required, based on engineering analysis.
2. Coating: G90 (Z275**)**.

B. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required, based on engineering analysis.
2. Coating: G90 (Z275).

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows, subject to engineering analysis by contractor’s design delegated engineer:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage).
2. Minimum Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows, subject to engineering analysis by contractor’s design delegated engineer:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage).
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web, subject to engineering analysis by contractor’s design delegated engineer.

D. Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows, subject to engineering analysis by contractor’s design delegated engineer:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage).
2. Flange Width: 1 inch plus the required design gap.

E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement. and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

F. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, as follows, subject to engineering analysis by contractor's design delegated engineer:
1. Minimum Base-Metal Thickness: 0.0428 inch (18 gage).

2.5 SOFFIT FRAMING

A. Soffit Frame (overhead framing at exterior canopy and interior soffits with limestone cladding): Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, with minimum proportions as follows, subject to engineering analysis by contractor's design delegated engineer:

1. Minimum Base-Metal Thickness: 0.0329 inch (20 gage).
2. Flange Width: 1-5/8 inches minimum.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel headless bolts, with encased end threaded**,** carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: Torque-controlled expansion anchor or adhesive anchor.
3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M or SSPC-Paint 20.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.9 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

1. Anchor tracks to support structure in accordance with approved shop drawings.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.

C. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Do not anchor top of studs to single deflection tracks unless a slotted deflection track is used.

D. Space studs as follows:

1. Stud Spacing: 16 inches unless noted otherwise or a lesser spacing is required based on the engineering analysis.

E. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

F. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

G. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

H. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

I. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

J. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

K. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to infill studs and anchor to building structure.
3. Connect drift clips to cold-formed steel framing and anchor to building structure.

L. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

M. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at 96-inch centers or centers indicated on Shop Drawings.

N. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

O. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

3.5 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 FIELD QUALITY CONTROL

A. Correct deficiencies in Work that Section 014533 “Special Inspection and Testing” reports and inspections indicate do not comply with the Contract Documents. Costs for correcting Work and any re-testing that may be necessary shall be at the Contractor’s expense.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Steel framing and supports for mechanical and electrical equipment.
2. Miscellaneous steel framing and supports for applications where framing and supports are not specified in other Sections for the following:

    a. Supports for wood blocking.
    b. Miscellaneous clip angles.
    c. Top of partition lateral support angles and channels

3. Loose bearing and leveling plates for applications where they are not specified in other Sections.
4. Aluminum trim.
5. Stainless steel or Hot Dipped Galvanized Z-girts for pool exterior/interior framing/furring where indicated.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:

1. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Division 05 Section "Pipe and Tube Railings."
3. Division 05 Section “Structural Steel Framing”

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples for Verification: For each type and finish of extruded nosing.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

2.0 PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316L.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
2. Material: Galvanized steel, ASTM A 653/A 653M, [commercial steel, Type B, with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.

G. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

H. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

I. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

J. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

K. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).

L. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

M. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

N. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

O. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

P. Stainless Steel Z-girts:

1. Non-vented stainless steel (16 ga.) z-girts by Monarch Metal Inc. or Architect approved equal.

a. Sizes indicated on drawings.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Use Type 316 for fastening Type 316 Stainless Steel in Pool area. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
3. Provide stainless-steel fasteners for fastening nickel silver.
4. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594

(ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1) and Group 2 (A4).

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

H. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

K. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

L. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

N. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations where Stainless steel is not indicated: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5.
2. Material Where Stainless Steel is Indicated: Alloy Group 1 (A1) and Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M) in pool area and where indicated.

O. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Primers: Provide primers that comply with [Division 09 painting Sections.] [Division 09 Section "High-Performance Coatings."] [Division 09 painting Sections and Division 09 Section "High-Performance Coatings."]

D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with [zinc-rich primer] [primer specified in Division 09 Section "High-Performance Coatings"] where indicated.

E. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

F. Galvanize shelf angles located in exterior walls.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.8 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with primer specified in Division 09 Section "High-Performance Coatings."

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm) unless otherwise indicated.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with [universal shop primer] [primers specified in Division 09 painting Sections] unless [zinc-rich primer is] [primers specified in Division 09 Section "High-Performance Coatings" are] indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."] [SSPC-SP 3, "Power Tool Cleaning."] [requirements indicated below:]

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.13 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel pipe and tube railings.

B. Related Requirements:

1. Division 06 Section “Rough Carpentry” for wood blocking for anchoring railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

    a. Show method of connecting and finishing members at intersections.

D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by a licensed New York State qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel Pipe and Tube Railings:
   1. Blum, Julius & Co., Inc.
   2. Wagner, R & B, Inc.; a division of the Wagner Companies.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails and Top Rails of Guards:

      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   2. Infill of Guards:

      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

   1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

2.4 STEEL AND IRON

A. Tubing: ASTM A500 (cold formed) or ASTM A513.

B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.5 FASTENERS

A. General: Provide the following:
1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329 for zinc coating.
2. Stainless-Steel Railings: Type 316 stainless-steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Intermediate Coats and Topcoats: Provide products that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

F. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

G. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage**,** but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

K. Form Changes in Direction as Follows:

1. As detailed.

L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of railing members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize indicated steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with primers specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" unless indicated.
2. Do not apply primer to galvanized surfaces.

G. Shop-Painted Finish: Comply with Section 099113 "Exterior Painting."

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

E. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach railings to wall with wall brackets**,** except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
5. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 055300 - WELDED STEEL GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel bar gratings

B. Related Requirements:

1. Division 03 Section “Cast-in-Place Concrete”
2. Division 05 Section “Structural Steel Framing”.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, details and attachment to other work.

1.4 QUALITY ASSURANCE

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, “Metal Bar Grating Manual”

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Bars for Bar Gratings: ASTM A 36 or ASTM A1011, Grade 36.

2.2 FASTENERS

A. Steel Bolts, Nuts, and Washers: Hex-head bolts, ASTM A307, Grade A; Hex nuts, ASTM A563; Washers ASTM F 844.

1. Finish: Hot-dip zinc coating per ASTM A 153.

2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.

B. Galvanizing Repair Paint: ASTM A 780.

2.4 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

1. Maximum Length of Individual Grating Section: 5 feet

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

1. Provide no fewer than four weld lugs for each grating section, with each lug shop welded to two bearing bars.

2.5 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

2.6 STEEL BAR GRATINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are limited to, the following:

1. All American Grating
2. McNichol's Co.
3. Borden Metal Products (Canada) Limited.
4. Fisher & Ludlow; Division of Harris Steel Limited.
5. Marwas Steel Co.; Laurel Steel Products Division.
6. Ohio Gratings, Inc.

B. Areaway Grating:

1. Bearing Bar Thickness: 3/8"
2. Bearing Bar Depth: 1-1/2"
3. Bearing Bar Spacing: 1-3/16" o.c.
4. Crossbar Spacing: 4" o.c.
5. Ends: Banded.
6. Traffic Surface: Plain (non-serrated)
7. Finish: Hot-dipped galvanized per ASTM A 153

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide hot-dipped galvanized or stainless steel anchorage devices and fasteners where necessary for securing gratings to in-place construction.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Fit exposed connections accurately together to form hairline joints, but allow sufficient space between units to accommodate thermal movements.

D. Field Welding: Not permitted.

E. Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

F. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

3.2 REPAIRS AND PROTECTION

A. Protect finishes from damage during construction.

B. Repairs:

1. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055300

SECTION 061000 - ROUGH CARPENTRY

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking and nailers.
3. Plywood panels.
4. Framing with dimension lumber.
5. Rough sawn lumber -Agriscience (ASC).

B. Related Requirements:

1. Division 09 and 10 for all materials associated with concealed wood blocking.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.

2. Power-driven fasteners.

3. Powder-actuated fasteners.

4. Expansion anchors.

5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

1. Dimension lumber framing.

2. Miscellaneous lumber.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

2.0 PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

3. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. Where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:

1. Plywood for raised platforms.

2. Concealed blocking.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No 2 grade.

1. Application: All interior partitions.

a. Species:

1) Hem-fir (north);NLGA.

2) Southern pine or mixed southern pine; SPIB.

3) Spruce-pine-fir; NLGA.

4) Hem-fir; WCLIB, or WWPA.

B. Load-Bearing Partitions: Construction or No 2 grade.

1. Application: Exterior walls.

2. Species:

1) Hem-fir (north);NLGA.

2) Southern pine or mixed southern pine; SPIB.

3) Spruce-pine-fir; NLGA.

4) Hem-fir; WCLIB, or WWPA.

C. Ceiling Joists: Construction or No 2 grade.

1. Species:

1) Hem-fir (north);NLGA.

2) Southern pine or mixed southern pine; SPIB.

3) Spruce-pine-fir; NLGA.

4) Hem-fir; WCLIB, or WWPA.

2.5 ROUGH SAWN LUMBER

A. Provide saw milled air dried lumber stock with moisture content between 10-15% max. Do not provide lumber with Crooks, wraps, twists, Bows, Splits, Staining, Decay or Checking. Provide sample boarding for review by Architect for approval.

1. Species:

a. Hem-fer (north); NLGA.

b. Southern pine or mixed southern pine; SPIB.

c. Spruce-pine-fir;NLGA.

d. Hem-fir; WCLIB, or WWPA.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.

3. Rooftop equipment bases and support curbs.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 15 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.

2. Hem-fir or hem-fir (north), Standard or 3 Common grade; NLGA, WCLIB, or WWPA.

3. Spruce-pine-fir (south) or spruce-pine-fir, Standard or 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.7 PLYWOOD PANELS

A. Plywood Panels: DOC PS 1, fire-retardant treated, in thickness on drawings.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.9 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

C. Sill Sealer Gaskets: Closed cell neoprene foam, ¼" thick, selected from manufacturer's standard widths to suit width of sill members indicated.

2.10 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

2.11 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 062013 – FINISH CARPENTRY

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Lumber siding **(WP-1)**

B. Related Information:

1. Detail A5/J A5.01 of the Contract Drawings for metal reveal (specified on Drawings only).

1.3 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Verification:

1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.

C. Compliance Certificates:

1. For lumber that is not marked with grade stamp.

1.5 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Lumber siding.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

2.0 PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.

1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 LUMBER SIDING

A. Provide kiln-dried lumber siding complying with DOC PS 20.

B. Species and Grade: Grade 1 Common white oak, heartwood; NeLMA, NLGA, or NHLA. Color and Finish - **To Match Existing**

1. Size: Nominal 1 inch x 6 inch (actual 3/4-inch thick by 5-1/2-inch wide).

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Provide materials that comply with performance requirements of AWPA C20 (lumber) at all lumber siding.

1. Fire-Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

3. Kiln-dry materials before and after treatment to levels required for untreated materials.

4. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.

5. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Finish Carpentry: Provide screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into substrate.

1. For white oak, provide stainless-steel fasteners, 6-lobe drive head. Provide “Dexxter” Composite 6-Lobe Drive, Swan Secure Everlasting Fastening, or approved equal.

2.5 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 09 Section " Staining And Transparent Finishing."

C. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

2. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.

3. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

3.4 SIDING INSTALLATION

A. Install siding to comply with manufacturer's written instructions.

B. Vertical Lumber Siding: Begin application at corner with tongue edge up. Install subsequent courses with tongue-and-groove edges tightly fitted together. Nail at each stud.

1. Leave 1/8-inch (3-mm) gap at trim and corners unless otherwise recommended by manufacturer, and apply sealant.

2. Butt joints only over framing or blocking, fastening with two screws on each side and staggering joints in subsequent courses.

3.5 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements. finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim.

2. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.

3. Shop finishing of interior architectural woodwork.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.

2. Section 062013 “Finish Carpentry” for lumber siding.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Anchors.

2. Adhesives.

3. Shop finishing materials.

4. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

5. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Shop Drawings:

1. Include the following:

a. Dimensioned plans, elevations, and sections.

b. Attachment details.

2. Show large-scale details.

3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.

4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each shop-applied color and finish specified.

1. Size:

a. Panel Products: 12 inches by 12 inches (300 mm by 300 mm).

b. Lumber Products: Not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.

D. Samples for Initial Selection: For each type of shop-applied exposed finish.

1. Size:

a. Panel Products: 12 inches by 12 inches (300 mm by 300 mm).

b. Lumber Products: Not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.

E. Samples for Verification: For the following:

1. Lumber for Transparent Finish: Not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.

2. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished interior architectural woodwork.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For architectural woodwork manufacturer and Installer.

B. Product Certificates: For the following:

1. Composite wood products.

2. Adhesives.

C. Evaluation Reports: For fire-retardant-treated wood materials, from ICC-ES.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTLAS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program or WI's Certified Compliance Program.

2. Installer Qualifications: Manufacturer of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical interior architectural woodwork as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is

operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI or WI certification program indicating that woodwork and installation complies with requirements of grades specified.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Architectural Woodwork Standards Grade: Premium.

B. Hardwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.

2. Species: As indicated on Drawings.

3. Cut: As indicated on Drawings.

4. Wood Moisture Content: 5 to 10 percent.

5. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.

6. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

C. Softwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.

2. Species: As indicated on Drawings.

3. Cut: As indicated on Drawings.

4. Wood Moisture Content: 5 to 10 percent.

5. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.

6. For base wider than available lumber, glue for width. Do not use veneered construction.

7. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

8. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (76 mm) wide.

2.3 FIRE-RETARDANT-TREATED WOOD MATERIALS

A. Fire-Retardant-Treated Wood Materials: Where fire-retardant-treated materials are indicated, use materials complying with requirements that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of the Architectural Woodwork Standards. Do not use materials that are warped, discolored, or otherwise defective.

2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2. For items indicated to receive a stained, transparent, or natural finish, use organic resin chemical formulation.

3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

1. Fire-Retardant Treatment: Complying with requirements; provide where indicated.

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.

2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

D. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.

b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.

2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.

4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.

b. Verify that parts fit as intended and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

5. See Staining and Transparent Finishing spec section 099300.

2.6 SHOP PRIMING

A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

B. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."

2.7 SHOP FINISHING

A. Finish interior architectural woodwork with transparent finish indicated on Drawings and/or Specs at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation. Field finishing option may be reviewed with or requested by Architect.

B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.

C. Transparent Finish:

1. Architectural Woodwork Standards Grade: Premium.

2. Staining: Match Architect's sample.

3. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.

4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter according to ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.

2. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.

F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.

2. Use fine finishing nails or finishing screws for exposed fastening, countersunk, and filled flush with interior architectural woodwork.

3. For shop-finished items, use filler matching finish of items being installed.

H. Standing and Running Trim:

1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.

2. Do not use pieces less than **96 inches** long, except where shorter single-length pieces are necessary.

3. Scarf running joints and stagger in adjacent and related members.

4. Fill gaps, if any, between top of base and wall with stainable plastic wood filler; sand smooth; and finish same as wood base if finished.

5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

3.3 FIELD QUALITY CONTROL

A. Inspections: Final inspection and acceptance shall be by the Architect.

3.4 REPAIR

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.

B. Where not possible to repair, replace defective woodwork.

C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.

1. Fill nail holes with matching filler where exposed.

2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semi-exposed surfaces.

END OF SECTION 064023

SECTION 070150 – RE-ROOFING REMOVALS

1.1 DESCRIPTION

A. Scope of Work:

This Section describes the requirements of the Demolition of existing roofing system(s) without limiting the generality implied by the Specifications and Drawings. The work under this Section shall include, but is not limited to the following principal items:

1. Existing roofing system tear-off.
2. Partial existing roofing system tear-off
3. Temporary roofing membrane
4. Roof re-cover preparation
5. Removal of base flashings

B. Related Sections:

1. Section 01500 - Construction Facilities and Temporary Controls (Temporary construction and environmental protection measures for reroofing preparation.)

1.2 MATERIALS OWNERSHIP

A. Except for items or materials indicated in the contract documents to be reused, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the project site and disposed of legally off-site.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D-1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Existing Membrane Roofing System: Built-up asphalt and PVC roofing membrane, roof insulation, surfacing, and components and accessories between deck and roofing membrane.

C. Roof Re-cover Preparation: Existing roofing membrane that is to remain and be prepared for reuse.

D. Roofing System Tear-Off: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system.

E. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated in the contract documents to be removed and reinstalled.

F. Existing to Remain: Existing items of construction that are not indicated in the contract documents to be removed.

1.4 SECURITY AND ACCESS

A. The security and maintenance of adequate safe means of egress and ingress to THE existing

building is of prime importance from the standpoint of maintaining safe access through construction operations at all times. The Contractor shall coordinate work with the Owner's site representative and all concerned.

B. Entrances and exits shall remain accessible at all times. Plans for any prolonged (other than momentary) obstruction to pedestrian and/or vehicular access must be cleared with the Owner's site representative prior to implementation.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated in this Section.

B. Temporary Roofing: Include Product Data and description of temporary roofing system. If temporary roof will remain in place, submit surface preparation requirements needed to receive permanent roofing, and submit a letter from roofing manufacturer stating acceptance of the temporary membrane and that its inclusion will not adversely affect the roofing system's resistance to fire and wind or its FM Global rating.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit to the Architect's office before the Work begins.

D. Fastener pull-out test report.

E. Landfill Records: Submit two (2) copies of a receipt showing acceptance of hazardous wastes, such as asbestos-containing material, by a landfill facility licensed to accept hazardous wastes.

F. Recycling Records: Submit two (2) copies of a receipt showing acceptance of recyclable material, such as EPDM and PVC membranes, by a recycling facility approved to accept recycled materials.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Reroofing Conference:

1. Meet with Owner, Architect and Owner's site representative.
2. Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:

    a. Reroofing preparation, including membrane roofing system manufacturer's written instructions.
    b. Temporary protection requirements for existing roofing system that is to remain during and after installation.
    c. Existing roof drains and roof drainage during each stage of reroofing and roof drain plugging and plug removal requirements at the end of each day's roofing operations.
    d. Construction schedule and availability of material. Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

e. Existing deck removal procedures and Owner's notification.
f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
g. Structural loading limitations of the existing roof deck during reroofing.
h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of fire-suppression, -protection and –alarm and –detection systems.
i. HVAC shutdown and sealing of air intakes.
j. Shutdown of fire-suppression, -protection, and –alarm and –detection systems.
k. Asbestos removal and discovery of asbestos-containing materials.
l. Governing regulations and requirements for insurance and certification if applicable.
m. Existing conditions that may require notification of the Architect before proceeding.

1.7 PROJECT CONDITIONS

A. The Owner will occupy portions of the building immediately below reroofing area. Conduct reroofing operations so Owner's operations will not be disrupted. Provide the Owner's site representative with 72 hours' notice of activities that may affect the Owner's operations.

1. Coordinate Work activities daily with the Owner's site representative so the Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or –detection equipment if needed, and evacuate occupants from below the Work area.
2. Before working over structurally impaired areas of roof deck, notify the Owner's site representative to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired roof deck area.

B. Protect the building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities, unless shown otherwise in the contract documents.

D. Conditions existing at the time of inspection for bidding will be maintained by the Owner as far as practical.

E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit the Work to proceed without water entering the existing roofing system or the building.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For replacement of work removed, comply with Specifications for type of work to be done.

B. Existing materials altered shall be replaced with like materials "Patch to Match", or as called for on the contract drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect the existing membrane roofing system that is indicated in the contract documents not to be reroofed.

B. Coordinate with the Owner's site representative to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

C. Maintain existing roof drains in functioning condition to ensure roof drainage at the end of each workday. Prevent debris from entering or blocking the existing or new roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at the end of each workday, when no work is taking place, or when rain is forecast.

D. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

A. General: Notify the Owner's site representative each day of extent or roof tear-off proposed for that day and obtain authorization to proceed. Do not remove more existing roofing than can be covered with the new finished roofing system in one (1) day without the permission of the Owner's site representative and the Architect.

B. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing using a power broom.

C. Remove pavers and accessories from the roofing membrane. (Store and protect accessories for reuse, if noted on drawings).

D. Roof Tear-Off: Remove the existing roofing membrane and other membrane roofing system components down to the existing vapor retarder on roof deck.

1. See Roof Cut Information on drawings for existing roof system information.

3.3 ROOF DECK PREPARATION

A. Inspect the existing roof deck after tear-off of membrane roofing system.

B. Verify that existing concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D-4263. Do not proceed with roofing work if moisture condenses under the plastic sheet.

C. If broken or loose fasteners that secure deck panels to one another or to the structure are observed of if deck appears or feels inadequately attached, immediately notify the Architect's office. Do not proceed with the installation of new material until directed to do so by the Architect.

D. If the existing roof deck is not suitable for receiving the new roofing system or if structural integrity of the existing roof deck is suspect, immediately notify the Architect's office. Do not proceed with the installation of new material until directed to do so by the Architect.

3.4 EXISTING BASE FLASHINGS

A. Remove existing base flashings around roof edges, parapets, curbs, walls, and penetrations.

1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of the same metal, weight, or thickness, and finish.

3.5 DISPOSAL

A. Collect and place demolished materials in containers. Promptly dispose of demolished materials at the end of each workday. Do not allow demolished materials to accumulate on the project site. Dispose of PVC membranes off-site at an acceptable recycling facility.

B. Transport and legally dispose of demolished materials off the Owner's property.

END OF SECTION 070150

SECTION 072100 - THERMAL INSULATION

1.0 PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mineral-wool board insulation.
2. Glass-fiber blanket (sound batt).
3. Spray polyurethane foam insulation with Ignition (thermal) barrier.
4. Loose-fill insulation.
5. Foam-Plastic board insulation

B. Related Sections include the following:

1. Division 07 Section(s) " KEE Roofing" for insulation specified as part of roofing construction.
2. Section 072200 "Tapered/Flat Insulation" for insulation at roofing areas.
3. Division 09 Section(s) "Gypsum Board Shaft Wall Assemblies and non-structural metal-framed assemblies of insulation specified by referencing this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Material Sample: (2) 6" square samples.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

D. Submit manufacturer's shop drawings for approval. Shop drawings shall show complete layout of the system and shall comply with the drainage patterns required by each insulation type.

1. Wall Shop drawings shall include: method of insulation securement, incorporation and paths of drainage layers including thru-wall flashing, and interface details at terminations and corners.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with minimum 10 years documented experience manufacturing products manufactured in this section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. If stored outside, raise insulation above ground or roof level on pallets and cover with tarpaulin or other waterproof membrane. Factory plastic wrapping shall be slit to ventilate and shall not be considered sufficient protection from weather.

2.0 PART 2 - PRODUCTS

2.1 MINERAL-WOOL BOARD INSULATION

1. Mineral-Wool Board, Type II, black matt faced: ASTM C612, Type II; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics. Nominal density of 6 lb/cu. ft.

2. Minimum R per inch: 4.2 as tested by ASTM C-518.

3. Available Manufacturers:

   a. Rockwool; Cavityrock.

   b. Architect approved equal.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

a. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

b. Extruded Polystyrene Board, Type IV : ASTM C578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.

   1) Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

c. Available Manufacturers:

   1) Kingspan Insulation.

   2) Owens Corning.

   3) Dupont.

2.3 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.

2. Guardian Fiberglass, Inc.

3. Knauf Fiber Glass.

4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.4 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84 with a primer over concrete surfaces and a UV-resistant acrylic coating. The wall assembly shall be tested in accordance with NFPA 285.

1. Physical Properties:

a. Core Density, ASTM D1622, sprayed in place: 1.9 pcf minimum.

b. Compressive Strength, ASTM D1621: 15 psi minimum.

c. Tensile Strength, ASTM D1623: 55 psi minimum.

d. Long-Term Thermal Resistance, per inch of thickness: R-6.0 minimum.

e. Permeance (perms), ASTM E96: 1.0 maximum.

f. Closed Cell Content, ASTM D6226: 90% minimum.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation.

b. BaySystems NorthAmerica, LLC.

c. Henry Company.

3. Location: Interior cavity walls as indicated on drawings.

4. Provide manufacturer’s standard Ignation (thermal) barrier and comply with and install in accordance with IBC Section 2603.4, 2015, 2012 and 2009 IRC Section R316.4 or 2006 IRC Section 314.4.

B. Provide primer for concrete surfaces in accordance with manufacturers guidelines.

C. Acrylic Latex Coating: spray-applied, acrylic latex coating, to ASTM D6083, no cracking or checking when tested to ASTM D4798 for accelerated weathering for 1000 hours, and meeting the following physical properties:

1. Uncured Properties: Solids Content By Volume (ASTM D2697): >50 percent.

2. Cured Properties:

a. Tensile Strength (ASTM D2370): 235 psi.

b. Elongation (ASTM D2370): 245 percent.

2.5 LOOSE-FILL INSULATION

A. Mineral-Wool Blanket, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics. Use at voids in exterior wall.

2.6 XPS RELATED MATERIALS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Plate: Perforated, stainless-steel sheet, 22 gage by 2 inches square.

B. Spindle: stainless steel; 12 gage in diameter; length to suit depth of insulation.

2.7 INSULATION FOR MISCELLANEOUS VOIDS

A. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

3.0 PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

B. Contractor shall verify that work done under polyisocyanurate sections meets the following:

1. Roof drains and/or scupper have been properly installed in the location shown on the approved shop drawings.

2. Roof curbs, nailers, equipment supports, vents and other items penetrating the roof are properly attached to substrate and are otherwise properly prepared.

3.2 INSTALLATION GENERAL

C. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

D. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

E. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

F. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF MINERAL-WOOL INSULATION

A. Install board insulation in curtain-wall construction according to thermally decoupled cladding securement system manufacturer's written instructions.

1. Hold insulation in place by securing thermally decoupled cladding support and straps or integral pockets within cladding support system, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place. Maintain cavity width of dimension indicated on Drawings between insulation and wall panel or tiles.

2. Install insulation to fit snugly without bowing.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

a. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1) Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

a. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1) Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2) Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3) Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4) For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5) For wood-framed construction, install blankets according to ASTM C1320 and as follows:

3.6 INSTALLATION OF LOOSE INSULATION

A. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume.

2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

B. Protect Polyisocyanurate insulation from weather with roof membrane manufacturer’s temporary tie in details at the end of each day.

END OF SECTION 072100

SECTION 072600 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyethylene vapor retarders.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Polyethylene vapor retarders.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D4397, **6-mil- (0.15-mm-)** thick sheet, with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).

B. Sheet Retarder: Certainteed MemBrain, The SMART Vapor Retarder. Polyimide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material has a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to greater than 10 perms using the wet cup method.

1. Water Vapor Permeance:

a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).

b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).

2. Fire Hazard Classification: ASTM E 84:

a. Maximum Flame Spread Index; 20.

b. Maximum Smoke Developed Index; 55.

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Place vapor retarders on side of construction indicated on Drawings.

B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 072600

SECTION 075419 – KEE ROOFING SYSTEM

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. KEE PVC Fleeceback Fully Adhered Roofing System

2. Vapor retarder.

3. Roof insulation.

4. Walkways.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.

2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.

3. Division 07 Section “Roof Accessories” for roof curbs, equipment supports, roof hatches, smoke vents, etc.

4. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

DEFINITIONS

C. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Design Wind Loads: Design wind loads applicable to Project from basic wind speed indicated nominal design 3-second gust of wind in miles per hour (meters per second) at 33 feet (10 m) above grade, according to Section 1609 “Wind loads” of the NYS building code (or ASCE 7);

a. Basic Wind Speed: 120 mph

b. Importance Factor: 1.15.

c. Exposure Category: B.

D. FMG Listing: FMG requirements shall set the minimum quality standards for all roofing membrane, base flashings, and component materials. Comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, and comply with the design wind loads (indicated above) as applicable.

1. Fire/Windstorm Classification: Class 1A-60.

2. Hail Resistance: MH.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.

2. Tapered insulation, including slopes “crickets”.

3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.

4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of complying with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

E. Field quality-control reports.

F. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For membrane roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer shall have a history of successfully producing specified products for a minimum of ten (10) years.

1. Installer Qualifications: Installer ('roofer') shall perform the work of this section and shall be a firm with not less than ten (10) years of successful experience in installation of roofing systems similar to those required for this project. The installer shall be currently certified by the manufacturer of the primary roofing materials to install their products and shall have been so for at least the past year.

B. Installer Certification: Obtain written certification from manufacturer of roofing system certifying that installer is approved by manufacturer for installation of specified roofing system.

C. Installer's Field Supervisor: Installer must maintain full-time supervisor on job site during times that work is in progress. Supervisor must have minimum of five (5) years' experience in roofing work similar to nature and scope of specified roofing.

D. All field installers shall receive training by the manufacturer.

E. Pre-Installation Conference: Before the vapor retarder work is scheduled to commence, after shop drawings have been reviewed, and before any materials are ordered, a conference will be called at the job site for the purpose of reviewing specifications, details, application requirements, staging areas, crane set-up locations, storage areas, protection and safety precautions, and what work is to be completed before the roofing operation begins. The intent is to resolve questions before the work is started. The conference will be attended by the Roofing Contractor and his/her foreman, the Owner's representative, a representative of the Roofing Manufacturer and the Architect.

F. Technical support (minimum at two (2) week intervals) during and upon completion of the installation an inspection shall be made by a Technical Representative of the manufacturer to observe the application of the roofing system. A written site visit report shall be submitted to the Roofing Contractor, the Architect, and the Owner the same day each inspection is performed. This submittal is a requirement for payment to the contractor.

G. Contractor's Responsibility:

1. Before application of roofing materials is commenced, the roofing contractor and the manufacturer's representative shall examine the roof deck and all conditions affecting his work and shall report in writing to the Architect any condition of deck or construction which could possibly adversely affect his work.

2. He shall not apply his roofing material until he is satisfied that such adverse conditions are removed and the materials being furnished and the application thereof will result in a finished product which will be unaffected by construction erection.

3. For the full term of the project, the contractor’s field supervisor or other identified personnel shall remove and pull test, progressively from newly completed work, one welded seam sample per every 400 lineal feet of robot welded seams and one per every 200 lineal feet of hand welded seams. Each welded seam sample shall be two inches in width x 1’-0” in length and centered over the seam. Each welded seam sample shall be numbered and labeled with the roof area location, date, time, and ambient conditions and the mechanics name. Each welded seam sample shall be logged, photographed and saved. The contractor shall submit the log and photographs weekly to the architect and owner for review and record. Partial and colds welds will not be accepted.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Prior to project close-out, the applicator shall submit the manufacturer's pre-approved Twenty-Five (25) Year No Dollar Limit Labor and Material Warranty.

B. Roof System Manufacturer's Warranty: The Roofing System Manufacturer shall provide a twenty-five (25) year, no dollar limit (NDL), non-prorated full system warranty covering the installed roofing system including but not limited to roof insulation, roof membrane, metal flashings, copings and accessory items constituting a part of the roof and systems.

1. The Warranty shall provide that the Roof System manufacturer will pay for repairs, including full replacement, necessary to stop leaks by complete repair or replacement resulting from natural deterioration of the roof or flashings, errors in the application of the roof or flashings, blisters, fishmouths, wrinkles or ridges in the roof and flashings and slippage of the membrane with no deductions and at no cost to the Owner.
2. The Warranty shall provide twenty-five (25) year, no dollar limit, non-prorated full replacement as stated above for wind damage and uplift. The maximum wind speed coverage shall be peak gusts of 90 mph measured at 10 meters above ground level.
3. Warranty shall not be voided due to ponding water and dead level areas.
4. The Warranty may not be nullified, voided or exclude coverage for normal traffic required to service roof top mounted equipment, machinery, appliances, appurtenances and accessories, emergency repairs, any claim or assertions between the Owner and Contractor including all claims or any failure resulting from improper application.
5. The Warranty shall include a glossary of terms or phrases utilized in the definition of Warranty terms.
6. The Warranty will require claim notification to the manufacturer.
7. The Warranty may be issued as the Manufacturer's standard form of warranty if appropriately modified as stated above and signatured by a corporate officer and accompanied with a corporate acknowledgment.
8. Warranty shall provide seventy-two (72) hour response in emergency situations.
9. The Warranty shall run directly to the Owner.

2.0 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers (Alphabetically) :

1. Carlisle SynTec, 1285 Ritner Highway, Carlisle PA 17013, Phone: 800-453-2554 (BASIS OF DESIGN)

2. OR EQUAL

2.2 MEMBRANE

A. Roofing membrane shall be a reinforced, Ketone Ethylene Ester (KEE) based PVC sheet conforming to the following minimum physical properties:

1. KEE-Based PVC Sheet Membrane: Laminated, Fleece-backed KEE membrane must be KEE HP or a KEE membrane that has a minimum of 36% of KEE solid plasticizer by weight

2. ASTM D 751, fabric reinforced 0.060” minimum thickness.

3. Top ply thickness over the scrim shall be .29” or thicker as per ASTM D751.

4. Approvals: UL Class listed, FM Approved (products shall bear seals of approval).

5. Reinforcement: Reinforced polyester fabric or other meeting the ASTM performance and dimensional stability criteria.

6. Color: As selected by Owner from manufacturer’s standard color palette

7. All accessory materials shall be supplied by, or approved by, the roofing manufacturer issuing the total system warranty.

2.3 FLASHING MEMBRANE

A. Flashing membranes shall meet the same requirements as stated in Section above of this specification.

2.4 MEMBRANE ADHESIVE

A. The adhesive for bonding the roofing membrane to the substrate shall be as follows:

1. Adhesive: A two component insulating urethane adhesive used to attach insulation. Packaging formats include 50 and 15 gallon drums as well as Dual Cartridges and 5 gallon Bag in a Box formats.

2. Adhesive shall be approved material by membrane manufacturer for substrate.

2.5 ACCESSORY PRODUCTS

A. The following products are supplied by the membrane manufacturer and may be incorporated in this specification as needed or detailed on the drawings:

B. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.

C. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 25 mm wide by 1.3 mm (1 inch wide by 0.05 inch) thick, pre-punched.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.

E. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 5 mm (3/16 inch) thick, and acceptable to membrane roofing system manufacturer.

F. Welder: Automatic hot air welding apparatus for seaming of sheets as approved by membrane manufacturer.

2.6 EDGE METAL AND MISCELLANEOUS METAL FABRICATIONS

A. 24-gauge galvanized sheet metal with a 20 mil PVC membrane covering glued and heat treated to metal. Form to configurations indicated on Drawings.

2.7 MISCELLANEOUS FASTENERS AND ANCHORS

A. In general, all fasteners, anchors, nails, concrete screws, straps, etcetera, shall be stainless steel. Unless otherwise indicated on the drawings, all fasteners and anchors shall have a minimum embedment of 1-1/2 inches and shall be approved for such use by the fastener manufacturer.

2.8 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1278 gypsum fiber reinforced gypsum substrate, Type X, 5/8" inch (16 mm) thick.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Securock

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate panel to roof deck.

2.9 VAPOR RETARDER

A. Vapor retarder is a minimum 40 mil composite sheet consisting of a self-adhering rubberized asphalt membrane. The underlayment board shall be primed with Low VOC CCW-702 Primer or CCW Cav-Grip in accordance with manufacturer's specifications. Vapor retarder must have a perm rating of 0.05 or less as per ASTM E90. Vapor retarder must be rated by the manufacturer as a temporary roof with an allowable exposure to the elements for 90 days."

B. Primer: Provide compatible primer, as recommended by vapor retarder Manufacturer, to prepare the substrate surface to receive vapor retarder.

2.10 ROOF INSULATION

A. General: Provide insulating materials to comply with requirements indicated for materials and with referenced standards in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

1. Provide tapered boards where indicated for sloping to drain. Fabricate with tapers indicated. Minimum taper to be 1/4" per foot slope on new buildings and 1/8" per foot on existing structures.

2. Provide minimum 4" thick flat boards as uniform bottom layer, where tapered systems are shown.

3. Insulation crickets: Minimum slope 1/2" per foot.

B. Polyisocyanurate Board Roof Insulation: Rigid, cellular, thermal insulation with polyisocyanurate closed-cell foam core and manufacturer's standard facing laminated to both sides; complying with ASTM-C1289-05a; type II Class 1 Grade 2 (20 psi).

1. Carlisle's Sure-Seal Polyisocyanurate or approved equal of other listed manufacturers compliant with their roof systems.

2. Provide 2 layers min. at flat insulation locations

3. Provide 4' x 8' boards.

2.11 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. Cover Board: ASTM C1278 gypsum fiber reinforced gypsum substrate gypsum substrate, 1/2 inch (13 mm) thick, factory primed.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Securock Protection mats in paragraph below may be placed on membrane roofing as protection from roof pavers or crushed-aggregate ballast.

2.12 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

1. Size: 36 by 36 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch (1.6 mm) in length, height, and thickness.

2. Provide at doorway locations and around roof top equipment.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.

2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Metal Deck: Fasten substrate board to top flanges of metal deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

2. Gypsum Deck: The Roofing Contractor shall perform a pull test on the existing gypsum roof deck to determine if a substrate board is required. If required, fasten substrate board to deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.4 VAPOR-RETARDER INSTALLATION

A. Comply with Manufacturer’s written instructions for installing ice and water shield underlayment.

B. Remove all debris from surfaces to receive vapor-retarder including, but not limited to, dust, dirt, oil, fasteners, aggregate, or any other contaminants that could cause damage to the underlayment. Surface must be dry.

C. Cut underlayment into manageable lengths for placement on roof substrate. Carefully align sheet along roof perimeter with the 3-inch film-covered salvage edge at the top, then expose a portion of the adhesive and adhere to substrate.

D. Remove remaining release liner while adhering underlayment to the substrate. Overlap seams 2 ½-inches minimum and end lap 6-inches minimum.

3.5 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

E. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together.

1. Adhere cover boards in a uniform coverage of full-spread insulation adhesive to resist uplift pressure at corners, perimeter, and field of roof.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Tape Seam Installation: Clean and prime the face of splice area, apply factory pre-applied splice tape and firmly roll side and end laps of overlapping membrane roofing according

to the manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

H. Repair tears, voids, and lapped seams in roofing that does not comply with requirements

I. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

J. Install membrane roofing and auxiliary materials to tie in to existing membrane roofing to maintain weather-tightness of transition and to not void warranty for existing membrane roofing system.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing,

inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <**Insert name**> of <**Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner.>

2. Address: <Insert address.>

3. Building Name/Type: <**Insert information.**>

4. Address: <Insert address.>

5. Area of Work: <Insert information.>

6. Acceptance Date: <**Insert date.**>

7. Warranty Period: <**Insert time.**>

8. Expiration Date: <**Insert date.**>

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a. Lightning;

b. Peak gust wind speed exceeding <**Insert wind speed**> mph (m/sec);

c. Fire;

d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;

f. Vapor condensation on bottom of roofing; and

g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month**>, <**Insert year**>.

1. Authorized Signature: <**Insert signature**>.

2. Name: <Insert name>.

3. Title: <Insert title>.

END OF SECTION 075419

SECTION 077100 - ROOF SPECIALTIES

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Manufactured roof edge systems.

2. Reglets and counterflashings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 061000 “Rough Carpentry” for wood blocking for attachment of roof edge systems and expansion joint covers.

2. Section 075419 “KEE Membrane Roofing.”

3. Section 077200 “Roof Accessories” for premanufactured pipe sleeves, pipe portals and fall protection.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install copings, roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the design pressures as noted.

D. ANSI/SPRI ES-1 Test Method RE-1 Test for Roof Edge Termination of Single Ply Roofing Membranes: The fascia shall be tested to secure the membrane to minimum 100 lbs/ft .

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's technical data, installation instructions and general recommendations for each product specified. Include data substantiating that materials and performance comply with requirements.

1. Manufactured Copings.

2. Manufactured roof edge systems.

C. Shop drawings indicating layout, joining, profiles, accessories, anchorages, flashing connections, and relationship to supporting structure and to adjoining roof and wall construction.

D. Samples for initial selection purposes in form of manufacturer's sample finishes showing full range of colors and textures available for those units with factory-applied color finishes.

E. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected. Provide samples of not less than the following sizes:

1. Fascia: 8-inch-long sections of each distinctly different fascia component, including extenders, exposed as finish work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.6 QUALITY ASSURANCE

A. Insurance Requirements: Provide fascia systems complying with Factory Mutual Loss Prevention Data Sheets 1-49 "Perimeter Flashing" requirements in either of the following categories and wind zones.

1. Approval by Factory Mutual Research Corporation for use indicated.

B. Industry Standards: Provide products which comply with applicable requirements of SMACNA "Architectural Sheet Metal Manual," except as otherwise indicated.

1.7 WARRANTY

A. Warranty: Roof edge systems provided in this section shall be incorporated into the **20 year NDL** warranty in Section 075323 “EPDM Membrane Roofing” and be covered by the roofing manufacturer (no exceptions).

1. Provide written documentation from roofing manufacturer attesting to the above.

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

   b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal

2. Finish Warranty Period: **20** years minimum from date of Substantial Completion.

1.8 JOB CONDITIONS

A. Coordinate work of this Section with adjoining work for proper sequencing of each installation to ensure best possible weather resistance and protection of materials and finishes against damage.

2.0 PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.

1. Non-Patinated Exposed Finish: Mill.

B. Aluminum Sheet: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15. Finish as follows:

1. Surface: Smooth, flat finish.

2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

   a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

   b. Concealed Surface: Pretreat with manufacturer's standard white or light- colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for use intended and as required for proper application of finish indicated but with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15. Finish as follows:

1. Exposed High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.2 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.3 MISCELLANEOUS ITEMS

A. Exposed Fasteners: Stainless steel, non-magnetic, of type and size standard with manufacturer for product and application indicated. Match finish of exposed heads with material being fastened.

B. Concealed Fasteners: Same metal as item fastened or other noncorrosive metal as recommended by manufacturer.

C. Mastic Sealant: Polyisobutylene; non-hardening, nonskinning, nondrying, nonmigrating sealant.

D. Isolation Tape: Self adhering, rubber or vinyl tape, minimum 1/32” thick x approximately 2” wide.

2.4 ROOF EDGE SYSTEMS AND COPINGS

A. Metal Roof Edge/Fascia/Gravel Stop and Coping:

1. Manufacturer’s complete, factory-made systems continuous around entire roof perimeter; depth of system to cover entire vertical face of wood blocking as detailed.

B. Available Products: Subject to compliance with specified requirements, products which may be incorporated in the work include, but are not limited to, the following:

1. Carlisle SynTec, Inc., or approved equal:

    a. **SecurEdge 200 Fascia** snap-on with water dam and 0.050” aluminum cover.

        1) Provide matching extender where shown or specified.

b. **SecurEdge 200** Coping system, Tapered version, 0.050" aluminum cover and extension.

2. Metal-Era, Inc., or approved equal:

a. **Perma-Tite System 200 Fascia**, snap-on with water dam and 0.050" aluminum cover.

1) Provide matching extender where shown or specified.

b. **Perma-Tite Coping** system, Tapered version, 0.050" aluminum cover and extension.

C. System components:

1. Fascia Coverplate: Designated thickness aluminum to interlock with continuous anchor bar and/or water dam.

a. 12'0" lengths typical

b. Face heights:

1) Existing roof edges to receive new roof edge: **9" facia with extender to equal 13" height.**

2) Formed Canted Cleat: 24 gauge galvanized steel.

3) 12'0" lengths typical

c. Spring Clips: stainless steel

1) 4'0" lengths typical

d. Splice plates shall be of same material and finish as coverplates; all shall be concealed behind coverplates.

e. Specially Fabricated Products: Ends, inside and outside corners, shall be factory prefabricated with welded joints (before finishing).

f. Provide all necessary sealants, gaskets, and fasteners for a complete watertight system.

1) Fasteners: 1-1/4" long galvanized ring shank roofing nails; fasten 12" o.c. in vertical face of waterdam and 6" o.c. in horizontal face of waterdam.

2. All corrosion-resistant fastening devices shall meet wind warranty and meet FM I-49 bulletin fastener size and spacing requirements and shall be concealed when system is completely installed.

2.5 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Castle Metal Products.

2. Cheney Flashing Company.

3. Fry Reglet Corporation.

4. Heckmann Building Products Inc.

5. Hickman Company, W. P.

6. Metal-Fab Manufacturing, LLC.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Copper: 16 oz./sq. ft. (0.55 mm thick).

2. Corners: Factory mitered and soldered.

3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches (100 mm) and in lengths not exceeding 12 feet (3.6 m designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:

1. Copper: 16 oz./sq. ft. (0.55 mm thick).

D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.

2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge

E. Copper Finish: Non-patinated, mill finish.

2.6 FABRICATION

A. General: Provide items designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.

B. Expansion Provisions: Fabricate running lengths to allow controlled expansion not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation or damage.

2.7 ALUMINUM FINISHES

A. General: Comply with AMA 2605 High Performance Fluoropolymer Color Coating "Finishes for Aluminum." For components which are assembled or welded in factory, apply finish after fabrication is completed.

1. Provide colors or color matches as indicated or, if not indicated, as selected by Architect from manufacturer's full range of standard colors.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer’s written installation instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive work of this Section, with vapor retarders, roof insulation, roofing membrane, flashing, and wall construction; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor products included in this Section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including wood, apply isolation tape or bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by aluminum producer.

C. Roof Edge Fascia Systems: Secure at roof edge according to FM I-49 loss prevention data sheet and manufacturer’s recommendations.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch-up damaged metal coatings.

B. Protection: Provide protective measures as required to ensure that work of this Section will be without damage or deterioration at time of substantial completion.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

1.1 DESCRIPTION

A. Scope of Work:

1. Vent Stack Flashings
2. Fall Arrest Anchors
3. Rubber Roof Walkway Pads
4. Roof Drains

B. Related work specified elsewhere:

1. Roofing Systems: Section 07

1.2 SUBMITTALS

A. Product Data:

1. Submit manufacturer's catalog cut sheets.

PART 2 - PRODUCTS

2.1 VENT STACK FLASHING

A. Thaler Model # SJ-27 Removable cap insulated stack flashing 18" high .064 mill finished 1100-OT alloy aluminum with PVC coated deck flange.

1. Provide removable metal hood and slotted metal collar type where indicated on the drawings.

2.2 Horizontal Lifeline Fall Protection System:

A. Design horizontal lifeline fall protection system to provide for safe execution roof equipment maintenance including travel restraint. Anchors consisting of a urethane insulated, epoxy primed, hollow steel support and mounting plate, urethane insulated flashing (stainless steel) with base seal. Provide deck flange compatible w/ Roof Membrane.

1. Acceptable manufacturer and product includes Thaler Metals, Model # K-700 Easy Slider (BASIS OF DESIGN) or equivalent system by Guardian Fall Protection, Kent, WA or Rooftop Anchor, Inc., Heber City, UT.

B. Horizontal Lifeline fall protection system (roof application) meeting OSHA 1910.66, Subparts D and F with: 3-1/2” dia. urethane insulated HSS anchor posts, wall thickness 1/4”, hot dipped galvanized ASTM 500, 12” high, welded and bolted to 1/2” x 8” x 8” 44W base plate, securement to suit substrate; Stainless steel fittings (swaged end, energy absorber, double locking carabiner, shuttles, end tensioner, intermediate brackets, corner pieces); Type 304 stainless steel cable 3/8” dia. 7 x 19 structure); 4 full body harnesses with integral shock absorber (by others); SJ-35 13”

high New-Standard STACK JACK Flashing of .031" 22 ga. Type 304 stainless steel to CSA B272-93, with Triple Pressure Grommet Top Seal and Base Seal and deck flange compatible w/ Roof Membrane.

2.3 RUBBER ROOF WALKWAY PAVERS

A. RubberForm Recycled Products, LLC,75 Michigan Street, Lockport, NY 14094-2629, 1-866-424-6981 or equal. (at roof access, top and base of ladders, and around rooftop equipment.

B. Standard Paver size: approx. 20" by 40" x 2" thick.

C. Pavers are composed of 100% recycled rubber, Standard Paver weight: 38 lbs. per paver. NOTE: Provide protection pads under Rubber Walkway Pavers as required by roof membrane manufacturer.

D. Pavers are in addition to roof membrane manufacturer's walkway materials to be used in the walking path from roof access to rooftop equipment locations.

2.4 ROOF DRAINS

A. Drain Body, Sump Receiver, and underdeck clamp: Existing to remain.

B. Flashing Clamp: Coated cast iron, non-puncturing type compression ring with integral, notched gravel stop and dome locking receiver.

C. Dome Strainer: Coated cast iron, low profile type, with narrow vertical slotted openings, bayonet locking flange, secured with stainless steel vandal resistant fasteners.

2.02 FASTENERS

A. Corrosion Resistant Fasteners: Brass, bronze, or Type 302 or 304 stainless steel bolts acceptable.

B. Anti-Seize Lubricant: Never-Seez by Bostik Chemical Group, Broadview, IL; Molycote 1000 by Dow Corning Corp, Midland, MI; Anti-Seize Lubricant by Loctite Corp, Newington, CT.

PART 3 EXECUTION

3.1 GENERAL

A. All existing roof leaders shall be plugged during the roofing operation to prevent anything from entering the leader. Unplug drains at the end of each day's work so that the roof may drain in the event of rain. Upon completion of the roofing and the drain installation, all drains shall be opened and tested for operation before final acceptance of the work.

3.2 PIPE INSULATION

A. Drain Bodies:

1. Insulate body of drains and conductor piping from drain to connection with existing or new drainage pipe.

3.3 SMOKE VENT

A. Examination:

1. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
2. Verify that deck, curbs, roof membrane, base flashing, and other items affecting Work of this Section are in place and positioned correctly.
3. Verify tolerances and correct improper condition
4. Identify conditions detrimental to providing proper quality and timely completions of work.
5. Do not proceed with installation until detrimental conditions have been corrected.

B. Installation:

1. Comply with manufacturer's recommendations.

    a. For Miami-Dade Hurricane Hatch™, install using the manufacturer’s anchoring options as detailed on shop drawings and installation instructions for wood curbs, steel curbs or concrete curbs.
2. Coordinate installation of components of this Section with installation of roof deck, roof structure, roofing membrane, and base flashing.
3. Coordinate installation of sealant and roofing cement with Work of this Section to ensure water tightness.
4. Securely anchor roof accessories in compliance with manufacturer's instructions.
5. Set units plumb, level, and true to line without warp or rack. Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
6. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

C. Field Quality Control:

1. Smoke Vent Testing: Test for proper operation after installation by one or both of the operational methods:
    a. Melting fusible link for inside at smoke vent level recommend using handheld propane tank torch. Replace fusible link, then close vents from the exterior at the roof top level.
    b. Pull internal and/or external manual pull handles and then close vents from the exterior at the roof top level.
2. Do not paint the internal mechanisms, especially moving parts such as spring/dampers, rotary latches and especially the fusible links. Painting any of these components may damage the vents and will void the warranty.

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END SECTION 07 72 00 - ROOF ACCESSORIES

SECTION 078413 - PENETRATION FIRESTOPPING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance rated constructions, including both empty opening and openings containing penetrating items.

B. Related Sections:

1. Division 22 and 23 Sections specifying duct and piping penetrations.

2. Division 26, 27, and 28 Sections specifying cable conduit penetrations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.

b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

2.0 PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

a. Penetrations located outside wall cavities.

b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84

2.2 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 FIRESTOPPING

A. Fire Barrier Packing Material: A through-penetration packing material that is non-asbestos, mold resistant, and inorganic.

1. Basis-of-Design Product: Subject to compliance with requirements, provide “Fire Barrier Packing Material (PM4 Bulk) by 3M Building & Commercial Services Division (3M Center 223-2S-24, St. Paul, MN 55144-1000) or comparable product by one of the following:

a. US Gypsum: Unfaced Thermafiber Safing

B. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as

demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

2.4 FILL MATERIALS

A. General Purpose Fire-Rated Sealant (common through-penetrations): Single-component, water-based, non-sag caulking grade sealant.

1. Available Products:

a. Bio FireShield: BIOSTOP BF 150+

b. Bio FireShield: BIOSTOP 350i

c. or approved equal

B. Latex Sealants (electrical cables, conduit and metal piping): Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

1. Available Products:

a. 3M: Fire Barrier IC 15WB+, CP 25WB+

b. Specified Technologies, Inc: SpecSeal LC150 Sealant

c. Specified Technologies, Inc: SpecSeal Elastomeric Sealant

C. Intumescent Composite Sheets (large openings and multiple through-penetrations): Rigid, fire-resistive panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

1. Available Products:

a. Bio FireShield: BIOSTOP Composite Sheet

b. 3M: Fire Barrier CS-195+

c. or approved equal

D. Intumescent Putties (electrical cables, conduit and metal piping): Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

1. Available Products:

a. Bio FireShield: BIOSTOP Fire Rated Intumescent Putty Stick

b. 3M: Fire Barrier Moldable Putty Sticks

c. Specified Technologies, Inc: SpecSeal Putty

E. Intumescent Wrap Strips (plastic & insulated pipes): Flexible strip of highly intumescent material.

1. Available Products:

a. Bio FireShield: BIOSTOP Wrap Strip

b. 3M: Fire Barrier FS-195+

c. Specified Technologies, Inc: SpecSeal Intumescent Red Wrap Strip

F. Intumescent Firestop Sealants (metallic, insulated & plastic pipes): water-based, flexible, highly intumescent sealant:

1. Available Products:

a. Bio FireShield: BIOSTOP 500+

b. Hilti: FS One High Performance Sealant

c. Specified Technologies, Inc: SpecSeal Sealant

G. Mortars (concrete, masonry, galvanized steel and common through-penetrations): Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

1. Available Products:

a. Bio FireShield: BIO Fire Rated K-10+ Mortar

b. 3M: Fire Barrier Mortar

c. Specified Technologies, Inc: SpecSeal Mortar

H. Pillows/Bags (large openings with cables, cable trays, blank opening or multiple penetrations): Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

1. Available Products:

a. Bio FireShield: BIO Firestop Pillows

b. 3M: Fire Barrier Pillows

c. Specified Technologies, Inc: SpecSeal Firestop Pillows

I. Silicone Foams (cables and cable tray penetrations): Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrink foam.

1. Available Products:

a. 3M: Fire Barrier Silicone RTV Foam 2001

b. Hilti: CP 620 Fire Foam

c. Specified Technologies, Inc: SpecSeal Pensil 200

J. Silicone Sealants (concrete & steel through-penetrating materials): Silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Available Products:

a. Bio FireShield: BIOTHERM 100 (gun grade) or 200SL (self-leveling)

b. 3M: Fire Barrier Silicone Sealant 2000 N/S or 2000+

c. Specified Technologies, Inc: SpecSeal Pensil 100

K. Spray-applied Fire Stop (All purpose fire- rated construction joint spray.):

1. Available Products:

a. Hilti Inc.: CP 672 Speed Spray

b. Or approved equal.

2.5 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently

bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.

4. Date of installation.

5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

2. Joints at exterior curtain-wall/floor intersections.

3. Joints in smoke barriers.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

2. Section 079513.13 "Interior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."

2) Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

a. Hilti, Inc.

b. Tremco, Inc; Tremco Fire Protection System Group.

c. A/D Fire Protection Systems Inc.

d. 3M Fire Protection Products.

e. Specified Technologies Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

a. Hilti, Inc.

b. Tremco, Inc; Tremco Fire Protection System Group.

c. A/D Fire Protection Systems Inc.

d. 3M Fire Protection Products.

e. Specified Technologies Inc.

2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

2.3 ACCESSORIES

A. Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.

2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.

3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.

3. Designation of applicable testing agency.

4. Date of installation.

5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHDG.

B. Perimeter Joint Firestopping Systems:

1. UL-Classified Perimeter Fire-Containment Systems: CW-D-1045.

2. Integrity Rating: 1 hour.
3. Insulation Rating: 1 hour.
4. Linear Opening Width: As indicated.
5. Movement Capabilities: Class II or Class III.
6. F-Rating: 2 hours.

END OF SECTION 078443

SECTION 079100 - PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preformed, foam joint seals.

2. Precured, extruded-silicone joint seals.

1.2 ACTION SUBMITTALS

A. Product Data: For each preformed joint seal product.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of preformed joint seal required, provide Samples with joint seals in joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint seals.

D. Preformed Joint Seal Schedule: Include the following information:

1. Joint seal location and designation.

2. Joint width and movement capability.

3. Joint seal manufacturer and product name.

4. Joint seal color.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each preformed joint seal for tests performed by a qualified testing agency.

1. All products must be certified by independent laboratory test report to be free in composition of any waxes or wax compounds using FTIR and DSC testing.

2. All products must be certified by independent laboratory test report to ASTM E90-09 and to meet or exceed an STC 52 in STC 56 wall and OxITC 38 rating in an OITC 38 wall.

B. Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Mockups: Install mockups of assemblies specified in other Sections that are indicated to receive preformed joint seals specified in this Section. Use materials and installation methods specified in this Section.

1.5 WARRANTY

A. Installer’s Warranty: Installer agrees to repair or replace preformed joint seals that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer agrees to furnish preformed joint seals to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PREFORMED, FOAM JOINT SEALS

A. Preformed, Foam Joint Seals: Manufacturer's standard joint seal manufactured from foam impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory applied extruded silicone face and factory applied adhesive for bonding to substrates.

1. Design Criteria:

a. Nominal Joint Width: As indicated on Drawings.

b. Movement Capability: -50 percent/+50 percent of nominal material size.

2. Joint Seal Color: As selected by Architect from manufacturer’s full range.

3. **Locations**: Provide joint system at Exterior Window, door, Storefront, Curtainwall jambs, heads, Control joints and other locations as indicated.

B. MANUFACTURERS:

1. Seismic Colorseal as manufactured by Emseal, LLC.

2. Willseal 600.

3. Or Architect approved equal.

2.2 EXTRUDED-SILICONE JOINT SEALS

Extruded-Silicone Joint Seals: Manufacturer's standard seal consisting of precured low-modulus silicone extrusion, with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Basis of Design: **Colorseal-on-a-Reel** manufactured Emseal Joint Syatems or Architect approved equals.

2. Joint Seal Width: Joint size indicated on Drawings

3. Joint Seal Color: As selected by Architect from full range of industry colors

2.3 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

B. Silicone Sealant: Nonstaining type for masonry applications. Color to match face of preformed joint seal.

C. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.

D. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints to comply with preformed joint seal manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

a. Concrete.

b. Masonry.

c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. Nonporous joint substrates include the following:

   a. Metal.

   b. Glass.

   c. Porcelain enamel.

   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Installation of Preformed, Foam Joint Seals:

1. Install each length of seal immediately after removing protective wrapping.

2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.

3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.

4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions. Apply masking tape to each side of joint, outside of area to be covered by seal system.

5. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed seal system manufacturer's written instructions.

3.4 PROTECTION

A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or

deteriorated seals immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079100

SECTION 079200 - JOINT SEALANTS

1.0 PART 1 – G ENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

2. Urethane joint sealants.

3. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.

2. Conduct field tests for each application indicated below:

a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.

a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

4. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.

4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Pre-installation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer**.**

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

2.0 PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.

2. Sealant Primers for Nonporous Substrates: 250 g/L.

3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

E. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Non-staining, Non-sag, Neutral-Curing 100% Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 791.

b. GE Advanced Materials - Silicones; SilPruf NB SCS9000.

c. Pecora Corporation; NST.

B. Mildew-Resistant, Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolastic SL 1.

b. Bostik, Inc.; Chem-Calk 950.

c. Pecora Corporation; Urexpan NR-201.

d. Tremco Incorporated; Vulkem 45.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Pecora Corporation; AC-20 FTR.

   b. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

3.0 PART – EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.

    b. Masonry.

    c. Unglazed surfaces of ceramic tile.

    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.

    b. Glass.

    c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.

b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

a. Whether sealants filled joint cavities and are free of voids.

b. Whether sealant dimensions and configurations comply with specified requirements.

c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Tile control and expansion joints.

b. Other joints as indicated.

2. Joint Sealant: Urethane. Single component, pourable, traffic grade

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior and Interior joints in vertical surfaces and horizontal non-traffic surfaces (**JS-02**), where Preformed joint seal system not indicated.

1. Joint Locations:

a. Control and expansion joints in unit masonry.

b. Joints in exterior insulation and finish systems.

c. Joints between different materials listed above.

d. Perimeter joints between materials listed above and frames of doors & windows.

e. Control and expansion joints in ceilings and other overhead surfaces.

f. Other joints as indicated.

2. Joint Sealant: Silicone. Single component, non-sag, neutral curing, Class 100/50.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Control and expansion joints in tile flooring.

b. Other joints as indicated.

2. Joint Sealant: Urethane. Single component, pourable, traffic grade.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Sealant Location:

a. Tile control and expansion joints where indicated.

b. Other joints as indicated.

2. Joint Sealant: Silicone. Mildew resistant, single component, non-sag, neutral curing.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.

b. Other joints as indicated.

2. Joint Sealant: Acoustical.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 081416 - FLUSH WOOD DOORS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer faces.

2. Factory finishing wood doors.

3. Factory fitting wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section “Door Schedule.”

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

2. ANSI A208.1 – Wood Particleboard.

3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.

4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.

5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.

6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.

2. Indicate dimensions and locations of mortises and holes for hardware.

3. Indicate dimensions and locations of cutouts.

4. Indicate requirements for veneer matching.

5. Indicate location and extent of hardware blocking.

6. Indicate construction details not covered in Product Data.

7. Indicate doors to be factory finished and finish requirements.

8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.

a. Provide samples for each species of veneer and core material.

b. Finish veneer faced door samples with same materials proposed for factory finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer’s warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors’.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL10C.

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.

2. Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.

3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid Core Interior Doors: Life of installation.

2.0 PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45-, 60-, and 90-minute rated doors. Comply with specified requirements for exposed edges.

2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.

b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

2.2 CORE CONSTRUCTION

A. Fire Resistant Composite Core Doors:

1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.

2. Blocking: As indicated under article “Blocking”.

3. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 BLOCKING

A. Non-Fire-Rated Doors:

1. Provide blocking as indicated below:

c. HB1: 5-inch in doors indicated to have closers and overhead stops.

d. HB5: Two 5-inch x 14-inch corner blocking, in doors indicated to have flush bolts.

B. Fire Rated Doors:

1. Provide blocking as indicated below:

a. HB1: 5-inch in doors indicated to have closers and overhead stops.

b. HB5: Two 5-inch x 14-inch corner blocking in doors indicated to have flush bolts.

2.4 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Graham Wood Doors, a division of ASSA ABLOY Wood Doors (GR): GPD Premium Series.

2. Eggers Industries (EG): Premium Series.

3. Marshfield-Algoma (MF): Signature Series.

4. Algoma Hardwoods, Inc.

B. Interior Solid Core Doors:

1. Grade: Premium.

2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.

a. To match existing, field verify

3. Match between Veneer Leaves: Book match.

4. Assembly of Veneer Leaves on Door Faces:

a. Running Match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Transom Match: Continuous match.

7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.

10. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.6 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.

1. Comply with requirements in NFPA 80 for fire rated doors.

2. Undercut: As required per manufacturer's templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."

3. Louvers: Factory install louvers in prepared openings.

C. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.7 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.

2. Staining:

a. Custom stain to match architect’s sample.

3. Sheen: Satin.

3.0 PART - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 081600 - FRP/Aluminum Hybrid Doors

PART 1 GENERAL

1.01 SECTION INCLUDES

A. FRP/Aluminum Hybrid Door.

1.02 RELATED SECTIONS

A. Section 087100 “Door Hardware.”

B. Section 088000 “Glazing.”

C. Section 084113 “Aluminum-Framed Entrances and Storefronts.”

1.03 REFRENCES

A. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.

B. AAMA 1503-98 – Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

C. ANSI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance of Steel Doors and Hardware Reinforcing.

D. ASTM-B117 – Standard Practices for Operating Salt Spray (Fog) Apparatus.

E. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

F. ASTM-B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

G. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.

H. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.

I. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.

J. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.

K. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

L. ASTM-D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

M. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.

N. ASTM-D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

O. ASTM-D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

P. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

Q. ASTM-D3029 – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).

R. ASTM-D5116 – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.

S. ASTM-D5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).

T. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.

U. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

V. ASTM-E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

W. ASTM-E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

X. ASTM-E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

Y. ASTM-E1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

Z. ASTM-E1996 – Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.

AA. ASTM-F476 – Standard Test Methods for Security of Swinging Door Assemblies.

BB. ASTM-F1642-04 – Standard Test Method for Glazing Systems Subject to Air Blast Loading.

CC. NWWDA T.M. 7-90 – Cycle Slam Test Method.

DD. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.

EE. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.

FF. TAS 201 – Impact Test Procedures.

GG. TAS 202 – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.

HH. TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

1.04 SUBMITTALS

A. Must comply with Section 013300 “Submittal Procedures.”

B. Action Submittals/ Informational Submittals.

1. Product Data.

a. Submit manufacturer’s product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.

2. Shop Drawings.

a. Submit manufacturer’s shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.

3. Samples.

a. Submit manufacturer’s door sample composed of door face sheet, core, framing and finish.

b. Submit manufacturer’s sample of standard colors for door face and frame.

4. Testing and Evaluation Reports.

a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.04.

5. Manufacturer Reports.

a. Manufacturer’s Project References.

1. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.

C. Closeout Submittals.

1. Operation and Maintenance Manual.

a. Submit manufacturer’s maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.

2. Warranty Documentation.

a. Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications.

1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.

2. Door and frame components must be fabricated by same manufacturer.

3. Evidence of a documented complaint resolution quality management system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery.

1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.

2. Labels clearly identifying opening, door mark, and manufacturer.

B. Storage.

1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.

C. Handling.

1. Protect materials and finish from damage during handling and installation.

1.07 WARRANTY

A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.

B. Standard Period.

1. Ten years starting on date of shipment.

C. Limited lifetime

1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.

D. Finish

1. Kynar painted aluminum: 10 years.

2. Painted SL-17, SL-18, SL-19, SL-19-1, and SL-20 face sheets: 5 years.

3. Painted AF-150 frames, AF-250 frames: 3 years.

4. Anodized, aluminum:10 years.

5. Thresholds do not have a finish warranty.

PART 2 PRODUCTS

2.01 FRP/ALUMINUM HYBRID DOORS & THERMALLY-BROKEN ALUMINUM FRAMING SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured by the following:

1. Special-Lite, Inc., PO Box 6, Decatur, Michigan 49045, toll free (800) 821-6531, phone (269) 423-7068, Fax (800) 423-7610, website: www.special-lite.com, email: info@special-lite.com.

a. Local Representative: Dugan Associates, Mary Ann Valenti, website: www.duganassoc.com, email: maryann@duganassoc.com, Phone: (585) 223-4204, Fax: (585) 223-6461.

2.02 DOORS

A. Model: SL-20 Sandstone Texture Hybrid FRP Door installed in Aluminum Framing

B. Door Opening Size.

1. As indicated on Drawings.

C. Construction.

1. Door Thickness.

a. 1-3/4".

2. Stiles & Rails.

a. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.

b. Minimum 2-5/16" deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.

c. Screw or snap in place applied caps are not acceptable.

d. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.

e. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.

f. Meeting stiles to include integral pocket to accept pile brush weather seal.

3. Corners.

a. Mitered.

b. Secured with 3/8” diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.

c. 1-1/4” x 1-1/4” x 3/16” 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.

d. Weld, glue, or other methods of corner joinery are not acceptable.

4. Core.

a. Poured-in-place polyurethane foam.

b. Laid in foam cores are not acceptable.

c. Foam Plastic Insulated Doors: IBC 2603.4.

1. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.

2. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.

3. IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032” aluminum or 0.016” steel.

4. Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.

5. Face Sheet.

a. Exterior

1. 0.120” thick, Sandstone texture, through color Speclite 3 integral surfaseal film FRP sheet.

2. Class C standard.

b. Interior

1. 0.120” thick, Sandstone texture, through color with Speclite 3 integral surfaseal film FRP sheet.

2. Class A.

c. Attachment of face sheet.

1. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.

2. Use of glue to bond face sheet to core or extrusions is not acceptable.

6. Cutouts.

a. Manufacture doors with cutouts for required vision lites, louvers, and panels.

7. Hardware.

a. Pre-machine doors in accordance with templates from specified hardware manufacturers.

b. Surface mounted closures will be reinforced for but not prepped or installed at factory.

c. Factory install door hardware.

8. Reinforcements.

a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.

b. Sheet and plate to conform to ASTM-B209.

c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

d. Bars and tubes to meet ASTM-B221.

2.03 FRAMING

A. Model: 2″ x 4-1/2″ SL-450TB and 2″ x 6″ SL-600TB Thermally-Broken Aluminum Framing.

1. Materials: Aluminum Members

a. Aluminum extrusions made 6061 or 6063 aluminum alloys.

b. Sheet and plate to conform to ASTM-B209

c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

2. Perimeter Frame Members.

3. Storefront frame with thermally broken pocket filler.
4. Factory fabricated.
5. Open-back framing is not acceptable.
6. Thermal Strut.
    1. Fiber reinforced plastic, no other materials will be accepted.
7. Applied Door Stops.
    1. 5/8” x 1-1/4” or 5/8” x 1-3/4”, 0.125” wall thickness, with screws and weather-stripping.
    2. Provide solid ½” aluminum bar behind door stop for closer shoe attachment.
    3. Pressure gasketing for weathering seal.
    4. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
    5. Minimum ½” aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221.
8. Caulking.
    1. Caulk joints before assembling frame members.
9. Frame Member to Member Connections.
    1. Secure joints with fasteners.
    2. Provide hairline butt joint appearance.
    3. Shear block construction only, no screw spline allowed.
10. Hardware
    1. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
    2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
    3. Factory install door hardware.
11. Anchors:
    1. Anchors appropriate for wall conditions to anchor framing to wall materials.
    2. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.

3. Secure head and sill members of transom, side lites, and similar conditions.

2.03 PERFORMANCE

A. Face Sheet.

1. Standard Exterior Class C 0.120" thick, Sandstone texture, through color with SpecLite 3 integral surfaseal film FRP sheet.

a. Flexural Strength, ASTM-D790: 21 x 10^3 psi.

b. Flexural Modulus, ASTM-D790: 0.7 x 10^6 psi.

c. Tensile Strength, ASTM-D638: 13 x 10^3 psi.

d. Tensile Modulus, ASTM-D638: 1.2 x 10^6 psi.

e. Barcol Hardness, ASTM-D2583: 55.

f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.

g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.

h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.

i. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.

j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.

k. Chemical Resistance.

1. Excellent Rating.

a. Acetic Acid, Concentrated.

b. Acetic Acid, 5%.

c. Bleach Solution.

d. Detergent Solution.

e. Distilled Water.

f. Ethyl Acetate.

g. Formaldehyde.

h. Heptane.

i. Hydrochloric Acid, 10%.

j. Hydrogen Peroxide, 3%.

k. Isooctane.

l. Lactic Acid, 10%.

2. Interior Face Only Class A 0.120" thick, Sandstone texture, through color with SpecLite 3 integral surfaseal film FRP sheet.

a. Flexural Strength, ASTM-D790: 13 x 10^3 psi.

b. Flexural Modulus, ASTM-D790: 0.57 x 10^6 psi.

c. Tensile Strength, ASTM-D638: 6.8 x 10^3 psi.

d. Tensile Modulus, ASTM-D638: 0.90 x 10^6 psi.

e. Barcol Hardness, ASTM-D2583: 40.

f. Izod Impact, ASTM-D256: 12.0 ft-lb/in notched.

g. Gardner Impact Strength, ASTM-D3029: 45 in-lb.

h. Water Absorption, ASTM-D570: 0.32%/24hrs at 77°F.

i. Surface Burning, ASTM-E84: Flame Spread ≤ 25, Smoke Developed ≤ 450.

j. Taber Abrasion Resistance, Taber Test: 0.02% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.

B. Door Core.

1. Density, ASTM-D1622: ≤ 5.0 pcf.

2. Compressive Properties, ASTM-D1621: Compressive Strength ≥ 60 psi, Compressive Modulus ≥ 1948 psi.

3. Tensile and Tensile Adhesion Properties, ASTM-D1623: Tensile Adhesion, 3" x 3" FRP Facers ≥ 53 psi, Tensile Adhesion, 1" x 1" Foam ≥ 104 psi.

4. Thermal and Humid Aging, ASTM-D2126: Volume Change at 158 °F, 100% humidity, 14 days ≤ 13%.

5. Thermal Conductivity, ASTM-C518, Thermal Resistance ≥ 0.10 m^2K/W.

C. Door Panel.

1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.29 Btu/hr·ft^{2}·°F, CRFp = 55.

2. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.

2.04 MATERIALS

A. Aluminum Members.

1. Aluminum extrusions made 6061 or 6063 aluminum alloys.

2. Sheet and plate to conform to ASTM-B209.

3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

B. Fiberglass.

1. See 2.02.C.5.

C. Fasteners.

1. All exposed fasteners will have a finish to match material being fastened.

2. 410 stainless steel or other non-corrosive metal.

3. Must be compatible with items being fastened.

2.05 FABRICATION

A. Factory Assembly.

1. Door and frame components from the same manufacturer.

2. Required size for door and frame units, shall be as indicated on the drawings.

3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.

4. All cut edges to be free of burs.

5. Welding of doors or frames is not acceptable.

6. Maintain continuity of line and accurate relation of planes and angles.

7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication

1. All shop fabrication to be completed in accordance with manufactures process work instructions.

2. Quality control to be performed before leaving each department.

2.06 FINISHES

A. Doors

1. Aluminum.
    a. Mill.
        1. AA-M10C22A21-Flash.
    b. Anodizing.
        1. Class 1 Anodizing, minimum 0.7 mils thick.
            a. Color: Clear 215 R1, AA-M10C12C22A41.
2. FRP Face Sheets
    a. Through color.
        1. Exterior Face:
            a. Color: Color as selected by Architect from manufacturer's full range of colors.
            b. Texture: Sandstone
        2. Interior Face:
            a. Color: Color as selected by Architect from manufacturer's full range of colors.
            b. Texture: Sandstone

B. Frames
1. Aluminum.
    a. Mill.
        1. AA-M10C22A21-Flash.
    b. Anodizing.
        1. Class 1 Anodizing, minimum 0.7 mils thick.
            a. Color: Clear 215 R1, AA-M10C12C22A41.0

2.07 ACCESSORIES

A. Vision Lites:
1. Factory Glazing.
    a. Model.
        1. As specified in Section 088000 Glazing.
    b. Glazing Thickness.
        1. 1" Insulated.
    c. Rectangular Lites.

a. Size, as indicated on drawings.

B. Hardware:

1. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
2. Factory install hardware.
3. Hardware Schedule.
   a. Concealed adjustable bottom brush.
      1. SL-301.
   b. Flush Pull
      1. SL-86
   c. Concealed adjustable meeting stile astragal.
      1. Adjustable astragal by Special-Lite.
   d. Balance of hardware as specified in Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive doors.

B. Notify architect of conditions that would adversely affect installation or subsequent use.

C. Do no proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION

A. Install doors in accordance with manufacturer’s instructions.

B. Install doors plumb, level, square, true to line, and without warp or rack.

C. Anchor frames securely in place.

D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.

E. Set thresholds in bed of mastic and back seal.

F. Install exterior doors to be weathertight in closed position.

G. Repair minor damages to finish in accordance with manufacturer’s instructions and as approved by architect.

H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL

A. Manufacture's Field Services.

1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION

A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 081600

SECTION 083300 – OVERHEAD COILING DOORS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sectional coiling doors, as follows:

1. Exterior insulated overhead coiling weather sealed doors.

1.3 RELATED SECTIONS

A. Section 055000 “Metal Fabrications” for miscellaneous steel framing and supports at sectional overhead doors.

1.4 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Product Data, roughing-in diagrams, and installation instructions for each type and size of overhead door. Include manufacturer’s operating instructions and maintenance data.

C. Shop drawings for special components and installations which are not fully detailed or are necessary for installation.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide each sectional overhead door as a complete unit produced by a single manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators, and installation accessories.

1. Unless otherwise acceptable to Architect, furnish exterior coiling door units by one (1) manufacturer for entire Project.

B. Wind Loading: Design and reinforce exterior coiling doors to withstand a 25 psf wind-loading pressure.

C. Fire Tests: Fire-rated assemblies tested and labeled by Underwriters Laboratories or other recognized testing agency meeting NFPA 80.

2.0 PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Cookson Rolling Doors.
2. Wayne/Dalton Corp.
3. Cornell Iron Works.
4. Raynor Garage Door Co.
5. Overhead Door Co.

2.2 EXTERIOR INSULATED OVERHEAD COILING WEATHER SEALED DOOR (**COHD**)

1) Basis-of-Design:

a. Manufacturer: Overhead Door Corporation,

1) Model: Stormtite AP Model 627.

2) **Minimum Acceptable R-Value: 10.9**

3) Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C.H.I. Overhead Doors.

b. Clopay Building Products Company.

c. Overhead Door Corporation.

d. Wayne-Dalton Corp.

b. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1) Include tamperproof cycle counter.

c. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. (5.1 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283 or DASMA 105.

d. STC Rating: Through Curtain 28 (Installed System 21).

e. **Curtain R-Value: Not less than 10.9 (1.91 W/Msq).**

f. Door Curtain Material: 24-gauge stainless steel front and back.

g. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.

1) Insulated-Slat Interior Facing: Metal.

2) Slat Insulation: CFC- and HCFC-free foamed-in-place, polyurethane insulation.

3) Gasket Seal. Manufacturer's standard continuous gaskets between slats.

h. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from hot-dip galvanized steel and finished to match door.

i. Curtain Jamb Guides: Galvanized with exposed finish matching curtain slats.

j. Mounting: Face of wall- Provide additional blocking as required.

k. Finish- to match frame color of storefront

3.0 PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports according to shop drawings, manufacturer's instructions, and as specified.

B. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track from structural overhead framing with angle or channel hangers, welded and bolt-fastened in place. Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door-operating equipment.

C. After completing installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight / smoketight for entire perimeter.

3.1 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

2. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

3. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.2 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.

3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service is to include **12** months' full maintenance by skilled employees of coiling-door Installer. Include **quarterly** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083300

SECTION 083313 - COILING COUNTER SHUTTER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-rated counter shutter assemblies.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for shutter-opening framing and corner guards.

2. Section 085653 “Security Windows” for windows and countertops to be installed conjointly with fire-rated counter shutter.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter shutter and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

3. Include description of automatic closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.

2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.

4. Show locations of controls, locking devices**, detectors or replaceable fusible links**, and other accessories.

5. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.

2. Bottom bar **with sensor edge**.

3. Guides.

4. Brackets.

5. Hood.

6. Laminate-clad counter panel product for each type, color, pattern, and surface finish; laminated to core.

7. Locking device(s).

8. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **Installer and testing and inspecting agency**.

1. Fire-Rated Shutter Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.

2. Submit copy of DHI Fire and Egress Shutter Assembly Inspector (FDAI) certificate.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling counter shutters to include in maintenance manuals.

B. Record Documents: For fire-rated shutters, list of shutter numbers and applicable room name and number to which shutter accesses.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than **two** hours' normal travel time from Installer's place of business to Project site.

B. Fire-Rated Shutter Inspector Qualifications: Inspector for field quality control inspections of fire-rated shutter assemblies is to meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:

1. Shutter and Hardware Institute Fire and Egress Shutter Assembly Inspector (FDAI) certification.

1.6 WARRANTY

A. **Special Warranty**: Two years from date of installation against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain coiling counter shutters from single source from single manufacturer.

1. Obtain operators and controls from coiling counter shutter manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Shutter Assemblies: Complying with NFPA 80; listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to **NFPA 252 or UL 10B**.

1. Temperature-Rise Limit: Provide shutters that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

2. Smoke Control: Provide shutters that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of 3.0 cfm/sq. ft. (0.01524 cu. m/s x sq. m) of shutter opening at 0.10 inch wg (24.9 Pa) for both ambient and elevated temperature tests.

2.3 FIRE-RATED COUNTER SHUTTER ASSEMBLY <**FS-1**>

A. Fire-Rated Counter Shutter: Overhead fire-rated coiling shutter formed with curtain of interlocking metal slats.

1. Intended function at door: Door is intended to be used as fire shutter when only during emergency situation. Shall mounted above ceiling and only used if necessary.

B. Basis-of-Design Product: Subject to compliance with requirements, provide:

1. CornellCookson, Inc., tel: 800-233-8366, website: cornelliron.com

a. Model: **ERC11**.

2. Or comparable product by one of the following:

a. C.H.I. Overhead Shutters.

b. Clopay Building Products Company.

c. Overhead Shutter Corporation.

d. Wayne-Dalton Corp.

C. Operation Cycles: Shutter components and operators capable of operating for not less than **10,000** cycles. One operation cycle is complete when a shutter is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

D. Fire Rating: 1 hour

E. Shutter Curtain Material: Stainless steel.

F. Shutter Curtain Slats: Flat profile slats of 1-1/2-inch (38-mm) center-to-center height.

G. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.

H. Hood: Stainless steel.

1. Shape: Square.

2. Mounting: Face of wall.

I. Sill Configuration: Fire-rated, laminate counter.

1. Countertop provided for in Section 085653 Security Windows, 2.9 A.

J. Electric Shutter Operator:

1. Usage Classification: Light duty, up to 10 cycles per hour.

2. Operator Location: Wall, as indicated on Drawings.

3. Motor Exposure: Interior.

4. Motor Electrical Characteristics:

a. Horsepower: **1** hp.

b. Voltage:

1) 115-V ac single phase, 60 Hz.

5. Emergency Manual Operation: Manufacturer’s standard type.

6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.

a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.

7. Control Station(s): Where indicated on Drawings.

8. Release System:

a. Provide automatic-closing device that is inoperative during normal rolling fire counter shutter operations, with centrifugal governor unit complying with requirements of NFPA 80 and with an easily tested and reset release mechanism, and designed to be activated when the building's fire alarm system is alarmed.

K. Curtain Accessories: Equip shutter with smoke seals, automatic closing device, and astragal.

L. Shutter Finish:

1. Stainless Steel Finish: **ASTM A480/A480M No. 4 (polished directional satin)**.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 SHUTTER CURTAIN MATERIALS AND FABRICATION

A. Shutter Curtains: Fabricate coiling counter shutter curtain of interlocking metal slats in a continuous length for width of shutter without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by shutter manufacturer for performance, size, and type of shutter indicated, and as follows:

1. Stainless Steel Shutter Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness of 0.025 inch (0.64 mm); and as required.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

A. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):

1. Stainless Steel: Type 304, complying with ASTM A240/A240M or ASTM A666.

B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.7 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated shutter with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for shutter listing and labeling by a qualified testing agency.

B. Astragal: Equip each shutter bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

C. Automatic-Closing Device: Equip each fire-rated shutter with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and

reset release mechanism. **Release mechanism for motor-operated shutters allows testing without mechanical release of the shutter.** Automatic-closing device is to be designed for activation by the following:

1. Replaceable fusible links with temperature rise and melting point of **165 deg F (74 deg C)** interconnected and mounted on both sides of shutter opening.

2. Manufacturer's standard UL-labeled smoke detector and shutter-holder-release devices.

3. Manufacturer's standard UL-labeled heat detector and shutter-holder-release devices.

4. Building fire-detection, smoke-detection, and -alarm systems.

2.8 COUNTER SHUTTER ACCESSORIES

1. Fire-Rated, Laminate Counter: Countertop provided for in Section 085653 Security Windows, 2.9 A.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating member

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, **seamless** carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Shutters: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC SHUTTER OPERATORS

A. General: Electric shutter operator assembly of size and capacity recommended and provided by shutter manufacturer for shutter and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking shutter, and accessories required for proper operation.

1. Comply with NFPA 70.

2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each shutter.

C. Shutter Operator Location(s): Operator location indicated for each shutter.

1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of shutter and connected to shutter drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

D. Motors: Reversible-type motor **with controller (disconnect switch)** for motor exposure indicated for each shutter assembly.

1. Electrical Characteristics: Minimum as indicated for each shutter assembly. If not indicated, large enough to start, accelerate, and operate shutter in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.

2. Motors to be **UL 325** compliant and **UL 864** listed assembly.

3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized shutter with adjustable switches interlocked with motor controls and set to automatically stop shutter at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of shutter opening. **For fire-rated shutters, activation delays closing.**

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Type: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered shutter with capability for emergency manual operation. Design manual mechanism so required force for shutter operation does not exceed **25 lbf (111 N)**.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Battery Backup.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Directional Satin Finish: ASTM A480/A480M No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install coiling counter shutters and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling counter shutters, hoods, controls, and operators at the mounting locations indicated for each shutter.

C. Fire-Rated Shutters: Install according to NFPA 80.

D. Smoke-Control Shutters: Install according to NFPA 80 and NFPA 105.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections **with the assistance of a factory-authorized service representative**:

1. Test shutter release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed shutter. Reset shutter-closing mechanism after successful test.

2. Fire-Rated Shutter Inspections: Inspect each fire-rated shutter in accordance with NFPA 80, section 5.2.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired shutter assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated shutter assembly indicating compliance with each item listed in **NFPA 80 and NFPA 101**.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. After electrical circuitry has been energized, operate shutters to confirm proper motor rotation and shutter performance.

3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that shutters operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service is to include **12** months' full maintenance by skilled employees of coiling-shutter Installer. Include **quarterly** preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper shutter operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter shutters.

END OF SECTION 083313

SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermally broken aluminum-framed storefront systems.

2. Aluminum Entrance doors.

B. Related Sections:

1. Division 07 Section “Joint Sealants” for sealing perimeter joints.

2. Division 08 Section "Glazing" for glazing requirements for storefront windows, including those specified to be factory or site glazed units.

3. Division 08 Section “Door Hardware” for door hardware associated with aluminum framed entrances.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems (doors, frames, glass etc.) shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.

2. Dimensional tolerances of building frame and other adjacent construction.

3. Failure includes the following:

a. Deflection exceeding specified limits.

b. Thermal stresses transferring to building structure.

c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.

d. Glazing-to-glazing contact.

e. Noise or vibration created by wind and by thermal and structural movements.

f. Loosening or weakening of fasteners, attachments, and other components.

g. Sealant failure.

h. Failure of operating units, if any.

B. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified New York State licensed professional engineer responsible for their preparation, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.

a. Basic Wind Speed: 90 mph (40 m/s).

b. Importance Factor: 1.25.

c. Exposure Category: B.

2. Seismic Loads: As indicated on Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to an amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch (3.2 mm) and clearance between members and operable units directly below them to less than 1/16 inch (1.5 mm).

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.

2. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.

G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static test pressure of 12.0 psf (575 Pa).

I. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

J. Condensation Resistance (CRF): Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 0.45 (frame) and 70 (glass) when glazed with 1” (25 mm) insulated – ¼” (6 mm) clear low emissivity, ½” (12 mm) air, ¼” (6 mm) clear glass when tested according to AAMA 1503.1.

K. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having a conductive thermal transmittance (U-Value) not more than 0.38 BTU/hr – ft2 – F (2.49 W/m2 – K) when glazed with 1” (25 mm) insulated – ¼” (6 mm) clear low emissivity, ½” (12 mm) air, 1/4” (6 mm) clear glass and tested according to ASTM 1503.1.

L. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.

M. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed entrances and storefronts without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.

2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.

2. Anchorage.

3. Expansion provisions.

4. Glazing.

5. Flashing and drainage.

E. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified New York State licensed professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.

2. Include design calculations.

G. Qualification Data: For qualified Installer and testing agency.

H. Welding certificates.

I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

J. Field quality-control reports.

K. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

L. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Provide test reports from AAMA accredited laboratories certifying the performance as specified.

1. Test reports shall be accompanied by the storefront manufacturer’s letter of certification stating that the tested storefront meets or exceeds the referenced criteria for the appropriate storefront type.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or

more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Accessible Entrances: Comply with applicable provisions in ICC/ANSI A117.1.

F. Source Limitations for Aluminum-Framed Systems, Storefront systems, Aluminum flush doors: Obtain from single source from single manufacturer.

G. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

H. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems, Storefronts and doors that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.

b. Noise or vibration caused by thermal movements.

c. Deterioration of metals, and other materials beyond normal weathering.

d. Adhesive or cohesive sealant failures.

e. Water leakage through fixed glazing and framing areas.

f. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Factory installed hardware: Door Manufacturer to warrant attachment of door hardware for a period of not less than 10 years from date of shipment that:

1. Hardware is installed in accordance with the hardware manufacturer's specifications and instructions.

2. Hardware is securely mounted and, in normal usage, will not separate from the doors.

C. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

2.0 PART 2 – PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Structural Profiles: ASTM B 308/B 308M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.

3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.2 ALUMINUM FRAMING SYSTEM AND ENTRANCE DOORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide YKK AP YES 45 XT Center Set Storefront System by YKK AP America, Inc. or Architect approved equal by one of the following:

1. Tubelite, Inc.

2. Special-Lite, Inc.

B. Thermally Broken Storefront Framing System:

1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by shear block attachment. Provide corner butt glazing (Structurally glazed) where indicated on drawings.

2. Components: Manufacturer’s standard extruded aluminum mullions, 90-degree corner posts, entrance door framing, and indicated shapes.

3. Thermal Barrier: Provide continuous thermal barrier by means of a poured and debridged pocket consisting of a two-part, chemically curing high density polyurethane which is bonded to the aluminum by YKK ThermaBond Plus. System employing non-structural thermal barriers are not acceptable.

4. Caulking: Caulk joints before assembly frame membranes with silicone sealants.

5. Joints: Secure joint with fasteners and provide hairline butt joint appearance.

6. Hardware:

a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer’s standards and hardware schedule.

b. Factory install door hardware where new door hardware is scheduled with new doors and frames.

7. Anchors:

a. Anchors appropriate for wall conditions to anchor framing to wall materials.

b. Door jamb and header mounting holes: maximum of 24” centers.

c. Secure head and sill members of transom, side lites and similar conditions.

d. Side lites:

1) Factory pre-assembled side lites to greatest extent possible.

2) Mark frame assemblies according to location.

8. Removable Mullion: as indicated.

9. Fasteners:

a. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.

b. Compatibility: Compatible with items to be fastened.

c. Exposed Fasteners: Screws with finish matching items to be fastened.

10. Glazing Gaskets: Gaskets installed in captive assembly of glazing stops.

a. EPDM: ASTM D 2000.

11. Aluminum Sliding Service Window: As specified in Section 085800, for insertion into storefront framing system.

C. ENTRANCE DOORS:

1. Basis of design Product by YKK AP America, Inc., 35T Thermal Broken Entrance doors(exterior), 35M – Monumental commercial entrances (interior) or Architect approved equal by one of the following manufactures:

a. Kawneer North America.

b. Tubelite Inc.

c. CRL US Aluminum, A CRH Company.

2. Door opening size: As indicated on drawings and schedules.

3. Construction:

a. Door Thickness: 2”.

b. Corner Construction: Fabricate door corners joined by concealed reinforcement secured with screws, and sigma deep penetration welding.

c. Glazing Stops: Manufacturer's standard snap in glazing stops with EPDM glazing gaskets to prevent water infiltration.

d. Weather-stripping: Manufacturer's standard pile type in replaceable rabbets for stiles; manufacturer's standard EPDM bulb type for door frames.

e. Hardware Reinforcement:

1) Provide 1/8" solid aluminum for all hardware attachment points at doors. For door closers provide 1/8" reinforcement on inside and outside faces of doors to accommodate possible through bolt attachment.

2) Coordinated with door schedule and hardware specification.

f. Hardware:

1) Pre-machine doors in accordance with templates from specified hardware manufacturers and per door hardware schedule.

2) Factory install door hardware where new door hardware is scheduled with new doors and frames.

4. Fasteners: Aluminum or AISI 300 series stainless steel warranted to be non-corrosive and compatible with aluminum components.

a. Exposed Fasteners: Screws with finish matching items to be fastened.

5. Trim Pieces- Furnish and install all matching/required trim pieces, closures, and column covers to allow for installation of storefront into existing construction.

2.3 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Structural Glazing Sealants: ASTM C1184 chemically curing silicone formulation that is compatible with system components with which it comes in contact; specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.

1. Color: As selected by Architect from manufacturer's full range of colors.

2.4 ENTRANCE DOOR HARDWARE

A. Refer to Division 08 Section "Door Hardware" for requirements of hardware items.

2.5 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.

4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from interior.

7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. At storefront elevations requiring wind load consideration, stiffen rectangular .125” aluminum tubing with steel channels to meet design wind loading and supply applied glazing stops to suit infill thickness.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using screw-spline system.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Provide Clear Anodized Plus.

1. Anodized Finishing: Prepare aluminum surfaces for specified finish: apply shop finish in accordance with the following:

a. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612. Aluminum extrusions shall be produced from quality-controlled billets meeting AA-6063-T5.

b. Retain finishes in this article to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts. See "Aluminum Finishes" Article in the Evaluations.

c. Exposed surfaces shall be free of scratches and other serious blemishes.

d. Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.

e. The anodized coating shall comply with all the requirements of AAMA 612: Voluntary Specifications, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coating on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction sites, and to resist the loss of color and gloss.

f. Overall coating thickness for finishes shall be a minimum of 0.7 mils.

g. Finishes Testing: Apply 0.5% solution NaOh, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes;

lightly wipe off NaOh; Do not clean area further. Submit samples with test area noted on each sample.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.

2. Do not install damaged components.

3. Fit joints to produce hairline joints free of burrs and distortion.

4. Rigidly secure non-movement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.

2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).

b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

END OF SECTION 084113

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Conventionally glazed aluminum curtain walls w/ Entrance doors.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain walls.

2. Section 079200 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.

3. Section 084113 “Aluminum Framed Entrances and Storefronts” for entrances.

4. Section 087100 “Door Hardware” for door hardware.

5. Section 088000 "Glazing" for curtain wall glazing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.

2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.

b. Anchorage.

c. Expansion provisions.

d. Glazing.

e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.

2. Anchorage.

3. Expansion provisions.

4. Glazing.

5. Flashing and drainage.

F. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by a New York State licensed qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:

1. Testing Program: Developed specifically for Project.

2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.

3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data:

1. For Installer and field-testing agency.

2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

C. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

D. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.

E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C1401. Include periodic quality-control reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and accredited by AAMA-certified laboratory and acceptable to Owner and Architect.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.

2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.

b. Noise or vibration created by wind and thermal and structural movements.

c. Deterioration of metals and other materials beyond normal weathering.

d. Water penetration through fixed glazing and framing areas.

e. Failure of operating components.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion for High Performance Organic Coating Finish.

3. Warranty Period: 10 years from date of Substantial Completion for Clear Anodized.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:

a. Thermal stresses transferring to building structure.

b. Glass breakage.

c. Noise or vibration created by wind and thermal and structural movements.

d. Loosening or weakening of fasteners, attachments, and other components.

e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Component & Cladding Wind Pressures Chart

(Sheet A0.00)

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less. 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans of greater than 13 feet 6 inches (4.1 m)

2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch (6.35-mm) for spans of greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans of less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (720 Pa).

2. Maximum Water Leakage: According to AAMA 501.1 Water leakage does not include water controlled by flashing and gutters or water that is drained to exterior.

I. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.

2. Vertical Inter-story Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

J. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.33 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. SHGC: Fixed glazing and framing areas as a system shall have a SHGC of no greater than 0.35 as determined according to NFRC 200.

3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 76 as determined according to NFRC 500.

K. Noise Reduction: Test according to ASTM E90, with ratings determined by ASTM E1332, as follows:

1. Outdoor-Indoor Transmission Class: Minimum 30.

2. Sound Transmission Class: Minimum 31.

L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 0 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).

b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).

2.2 SOURCE LIMITATIONS

A. Obtain all components of curtain-wall system, including framing venting windows, entrances and accessories, from single manufacturer.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Basis of design Product by YKK AP America, Inc., YKK AP YCW 750 XT Aluminum Curtain Wall System with 35T Thermally Broken Entrance doors or approved equal product by one of the following manufacturers:

1. Kawneer North America.

2. Tubelite Inc.

3. CRL US Aluminum, A CRH Company.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken with continuous perimeter anchor & continuous horizontal mullions attached to the curtain wall jambs with shear blocks.

2. Frame Depth:

a. 7 1/2” with 1” insulated glazing

1) Tested to AAMA 501-05 and TAS 202.

3. Glazing System: Retained mechanically with gaskets on four sides.

4. Glazing Plane: Front.

5. Frame finishes:

    1) Exterior: Clear Anodized Plus.

    2) Interior: Clear Anodized Plus.

    3) Anodized Finishing: Prepare aluminum surfaces for specified finish: apply shop finish in accordance with the following:

        a) Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612. Aluminum extrusions shall be produced from quality-controlled billets meeting AA-6063-T5.

        b) Exposed Surfaces shall be free of scratches and other serious blemishes.

        c) Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.

        d) The anodized coating shall comply with all of the requirements of AAMA 612: Voluntary Specifications,
        Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction sites, and to resist the loss of color and gloss.

        e) Overall coating thickness for finishes shall be a minimum of 0.7 mils.

        f) Finishes Testing: Apply 0.5% solution NaOh, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes; lightly wipe off NaOh; Do not clean area further. Submit samples with test area noted on each sample.

6. Fabrication Method: Either factory- or field-fabricated shear block system.

7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

8. Steel Reinforcement: As required by manufacturer and as shown on construction documents.

C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

2. Finish: Match adjacent glazed aluminum curtain-wall finish.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

E. Entrance Door Systems: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts".

2.4 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: ASTM C509 or ASTM C864. Compression-type, replaceable EPDM.

1. Color: Black.

C. Glazing Sealants: Silicone type as recommended by manufacturer.

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes into contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.

E. Bond-Breaker Tape: Manufacturer’s standard TFE-flurocarbon or polyethylene material to which sealants will not develop adhesion.

F. Spacers and Setting Blocks: Manufacturer’s standard elastomeric type.

2.5 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.

D. Structural Profiles: ASTM B308/B308M.

E. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.

2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.

3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

4. Provide manufacturer’s standard clip anchors/reinforcement back to existing building structure at curtainwall mullion midpoints (Existing 2nd floor).

F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and

pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Provisions for field replacement of glazing from exterior.

6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

7. Components curved to indicated radii.

D. Fabricate components to resist water penetration as follows:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method with shear-block system.

F. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.

2. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion.

3. Preparation includes, but is not limited to, cleaning and priming surfaces.

4. Seal joints watertight unless otherwise indicated.

5. Install glazing to comply with requirements in Section 088000 "Glazing."

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Seal joints watertight unless otherwise indicated.

H. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

J. Install components plumb and true in alignment with established lines and grades.

3.4 INSTALLATION OF OPERABLE UNITS

A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.5 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 088000 "Glazing."

3.6 INSTALLATION OF WEATHERSEAL SEALANT

A. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.7 ERECTION TOLERANCES

A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).

2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).

3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).

b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).

c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.

C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

a. Perform a minimum of two tests in areas as directed by Architect.

b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 50 and 100 percent completion.

2. Air Infiltration: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

a. Perform a minimum of two tests in areas as directed by Architect.

b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 50 and 100 percent completion.

3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 084413

SECTION 085653 - SECURITY WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vision security windows.

2. Fixed, transaction security windows with Transaction Countertop and Recessed Deal/ Pass-Thru Tray.

3. Sliding, transaction security windows with Transaction Countertop and Recessed Deal/ Pass-Thru Tray.

1.2 COORDINATION

A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachment details.

2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.

3. Location of weep holes.

4. Hardware for sliding window units.

5. Glazing details.

6. Details of **deal tray**, **transaction counter**, **and speaking aperture**.

C. Samples for Initial Selection: For frame members with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Framing: 12-inch- (305-mm-) long sections of frame members.

2. Transaction Drawer: 6 inches (150 mm) square.

E. Cutaway Sample: Corner of security window, made from 12-inch (305-mm) lengths of full-size components, and showing details of the following:

1. Joinery.

2. Anchorage.

3. Glazing.

F. Delegated Design Submittal: For security windows indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **Installer and testing agency**.

B. Welding certificates.

C. Product Test Reports: For each type of security window and accessory indicated as **ballistics or forced-entry** resistant, for tests performed by a qualified testing agency.

D. Configuration Disclosure Drawing: For each type of forced-entry-resistant security window, complying with ASTM F1233.

E. Examination reports documenting inspections of substrates, areas, and conditions.

F. Anchor inspection reports documenting inspections of built-in and cast-in anchors.

G. Field quality-control reports documenting inspections of installed products.

1. Field quality-control certification signed by Contractor.

H. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation **and maintenance** of units required for this Project.

B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.

B. Label security window packaging with drawing designation.

C. Store crated security windows on raised blocks to prevent moisture damage.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 SEQUENCING

A. Field Painting: Except where security windows have been pre-glazed before installation, complete field painting of security windows before glazing installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including deflections exceeding 1/4 inch (6 mm).

b. Failure of welds.

c. Excessive air leakage.

d. Faulty operation of sliding window hardware.

e. Faulty operation of transaction drawers.

f. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: **Three** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Attack Resistance: Provide units identical to those tested for compliance with requirements indicated, and as follows:

1. Ballistics Resistance, UL 752: **Listed and labeled as Level 7** in accordance with UL 752.

2. Ballistics Resistance, ASTM F1233: **Class R1** in accordance with ASTM F1233.

3. Ballistics Resistance, NIJ STD-0108.01: **Level IV (III++)** in accordance with NIJ STD-0108.01.

4. Forced-Entry Resistance, ASTM F1233: **Class R1** in accordance with ASTM F1233.

B. Energy Performance: Provide windows with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below **and certified and labeled in accordance with NFRC**:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).

2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 VISION SECURITY WINDOWS **(V2)**

A. Provide vision security windows with framing on four sides and no operable sash or ventilator.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Armortex. (5926 Corridor Pkwy Schertz, TX 78154 Tel: 210-661-8306 800-880-8306 FAX: 210-661-8308 www.armortex.com)

1) Model #: **WI-FW-HM-RS.**

2) Or Architect approved equal.

B. Framing: Fabricate perimeter framing, mullions, and glazing stops from **steel** as follows:

1. Profile: Manufacturer's standard with minimum face dimension indicated.

a. Minimum Face Dimension: As indicated on Drawings.

2. Length, Width, and Depth: As indicated on Drawings.

C. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."

D. Materials:

1. Mild Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.

3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

2.3 FIXED, TRANSACTION SECURITY WINDOWS **(V1)**

A. Provide fixed, transaction security windows with ventilator capable of allowing transfer of documents.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Armortex. (5926 Corridor Pkwy Schertz, TX 78154 Tel: 210-661-8306 800-880-8306 FAX: 210-661-8308 www.armortex.com)

1) Model #: **WI-TW-HM-NV**.

2) Or Architect approved equal.

B. Configuration: One fixed-glazed panel.

C. Framing: Fabricate perimeter framing, mullions, and glazing stops from stainless steel as follows:

1. Profile: Manufacturer's standard, with minimum face dimension indicated.

a. Minimum Face Dimension: As indicated on Drawings.

2. Length, Width, and Depth: As indicated on Drawings.

D. Head and Jamb Framing: Designed for voice communication **by speech at normal volume**.

E. Channel-Frame Sill: Formed from stainless steel and designed for gasket glazing.

1. Transaction Counter: Manufacturer’s standard plastic laminate clad, **18 inches (457 mm)** deep by width as noted in Drawings, with integral deal tray centered in opening.

F. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."

G. Glazing Meeting Edges: Polished glazing.

H. Materials:

1. Mild Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.

3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **Type 304**.

2.4 SLIDING, TRANSACTION SECURITY WINDOWS **(V3)**

A. Provide sliding, transaction security windows.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Armortex. (5926 Corridor Pkwy Schertz, TX 78154 Tel: 210-661-8306 800-880-8306 FAX: 210-661-8308 www.armortex.com)

1) Model #: **WI-TW-HM-SW.**

2) Or Architect approved equal.

B. Configuration: As indicated on Drawings.

C. Operation: Manual open/manual closing**.**

D. Framing: Fabricate perimeter framing, mullions, and glazing stops from stainless steel as follows:

1. Profile: Manufacturer's standard, with minimum face dimension indicated.

a. Minimum Face Dimension: As indicated on Drawings.

2. Depth: As indicated on Drawings.

E. Head and Jamb Framing: Designed for voice communication by speech at normal volume and for gasket glazing. Removable header access panel on secure side.

F. Sill: Stainless steel channel frame designed for gasket glazing.

1. Transaction Counter: Manufacturer’s standard plastic laminate clad, **18 inches (457 mm)** deep by width as noted in Drawings, with integral deal tray located in opening as indicated on Drawings.

G. Sliding Window Hardware: Provide manufacturer's standard carrier supporting horizontal-sliding glazed panel with manufacturer's standard self-closing mechanism mounted in header. Provide manufacturer's standard pull and lock with two keys for each horizontal-sliding glazed panel.

H. Glazing and Glazing Materials: Comply with requirements in Section 088853 "Security Glazing."

1. Glazing Meeting Edges: Polished glazing.

I. Materials:

1. Mild Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.

3. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

4. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, **Type 304**.

2.5 FABRICATION

A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.

1. Provide units that are re-glazable from the secure side without dismantling the attack side of framing.

2. Prepare security windows for field glazing unless pre-glazing at the factory is indicated.

B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

C. Glazing Stops: Finish glazing stops to match security window framing.

1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.

2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.

D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

F. Factory-cut openings in glazing for speaking apertures.

G. Pre-glazed Fabrication: Pre-glaze window units at factory, where required for applications indicated. Installation orientation of glazing to meet performance requirements. Comply with requirements in Section 088853 "Security Glazing."

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STEEL FINISHES

A. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

2.8 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Stainless Steel Sheet and Plate Finishes:

1. Directional Satin Finish: ASTM A480/A480M, No. 4.

2.9 ACCESSORIES

A. Transaction Countertop:

1. Manufacturer's high-pressure, decorative laminate-covered countertop; UL or ITS tested and labeled for 1-1/2-hour fire rating for approved use with security window assembly.

2. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Armortex. (5926 Corridor Pkwy Schertz, TX 78154 Tel: 210-661-8306 800-880-8306 FAX: 210-661-8308 www.armortex.com)

1) Model #: _____.

2) Or Architect approved equal.

3. Materials:

a. High Pressure Laminate over MDF core with ballistic fiberglass armor at front edge.

b. Size: **Width to Match Opening by 15 1/4 inches deep by 2 inches high.**

1) Coordinate layout of Transaction Countertop with Drawings.

c. Finish: Manufacturer’s standard (Black).

B. Recessed Deal / Pass-Thru Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Armortex. (5926 Corridor Pkwy Schertz, TX 78154 Tel: 210-661-8306 800-880-8306 FAX: 210-661-8308 www.armortex.com)

1) Model #: **TE-DT-FL-12.**

2) Or Architect approved equal.

2. Materials:

a. Formed from stainless steel **with hinged stainless-steel cover**; fabricated in curved shape with exposed flanges for recessed installation into horizontal surface.

1) Finish: #3 satin brushed finish.

b. Clear Opening Size: **10 inches wide by 8 inches deep by 1 1/2 inches high** (321 mm wide by 368 mm deep by 70 mm high).

c. Ballistics Resistance: **Same as security window**.

d. Listed and labeled as bullet resisting in accordance with UL 752.

C. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.

D. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16-inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate.

E. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

F. Glazing Strips and Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Molded EPDM or neoprene gaskets complying with ASTM D2000, Designations 2BC415 to 3BC620; molded PVC gaskets complying with ASTM D2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.

G. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.

1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.

2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

H. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.

I. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

J. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant remains permanently elastic, non-shrinking, and non-migrating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.

D. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.

2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

E. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for anchors, clips, and other security window anchors whose installation is specified in other Sections.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.

1. Install an attached or integral flange to secure side of security windows extending over rough-in opening gap so that gap has same **forced-entry-resistance and ballistics-resistance** performance as security window.

B. Voice-Communication-Type Framing: Attach removable glass spacers to jambs and head of glazing, located not more than 6 inches (152 mm) from each corner and spaced not more than 12 inches (305 mm) o.c.

C. Glazed Framing: Provide gasket-glazed framing. Comply with installation requirements in Section 088853 "Security Glazing."

D. Removable Glazing Stops and Trim: Fasten components with security fasteners.

E. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. **Provide stainless steel fasteners in stainless steel materials.**

F. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.

1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.

2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

G. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.5 ADJUSTING

A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

B. Adjust Deal/Pass-Thru tray hinged cover to provide a tight fit at contact points or smooth operation and weathertight and secure enclosure.

C. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.

B. Clean glass of security windows promptly after installation. Comply with requirements in Section 088853 "Security Glazing" for cleaning and maintenance.

C. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION 085653

SECTION 087100 – DOOR HARDWARE

Part 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes but not limited to the following:

1. Mechanical and/or electrical hardware.
2. Cylinder for hardware specified in other sections.

B. Related Requirements

1. Division 1 Section "Sustainable Design Requirements".
2. Division 01 Section “Closeout Procedures”
3. Division 06 Section “Rough Carpentry”.
4. Division 06 Section “Finish Carpentry”.
5. Division 08 Section “Operations and Maintenance”.
6. Division 08 Section “Hollow Metal Doors and Frames”.
7. Division 08 Section “Flush Wood Doors”.
8. Division 08 Section “Fiberglass Doors”.
9. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
10. Division 28 Section “Access Control”.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. NYS SED – Manual of Planning Standards (MPS).
8. State Building Codes, Local Amendments.

1.3 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 COORDINATION AND MEETINGS

A. Location: Conduct conferences on project site or other location as directed by the Architect/Owner.

B. Preinstallation Conference

1. Purpose of the Preinstallation conference is to:

   a. Coordinate between trades, so all understand their responsibilities.
   b. To instruct the installing contractors' personnel on the proper installation and adjustment of their respective products.
      1. The hardware supplier is responsible for bringing the installation instructions to the meeting.
   c. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
   d. Review sequence of operation narratives for each unique access-controlled opening.
   e. Review the requirements for local and state building codes and how they apply to doors, frames, and hardware.
      1. Gap requirements around the doors to follow NFPA 80.
      2. Opening forces to follow DOJ’s “2010 ADA Standards for accessible design”.
   f. Review any special applications.

2. Conference participants shall include but not limited to:

   a. General Contractor.
   b. Installer for doors, frames, and hardware.
   c. Supplier Representative.
   d. Owner and/or Owners Representative.
   e. Electrical Contractor (if applicable).
   f. System Integrator (if applicable).
   g. Construction Manager (if applicable).
   h. Architect and/or Architects Consultant.

C. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

1.5 SUBMITTALS

A. Submittal Sequence to follow in this order and each are to be submitted under separate cover:
   1. Information Submittal.
   2. Door Hardware Schedule.
   3. Hardware Product Data.
   4. Samples.
   5. Riser Diagrams.
   6. Wiring Diagrams (Only after final approval of the hardware has been received).

7. Closeout Submittals.
8. Submit door hardware schedule concurrent with submissions of Product Data, Samples, Riser Diagrams.

B. Information Submittals:

1. Qualification Data: Submit qualification data for the Installer and Supplier as defined under Quality Assurance of the Section.
2. Product Certifications:
   a. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
3. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Use same scheduling sequence and use same door numbers as in the Contract Documents.

2. Content: Include the following information:
   a. Index of openings showing hardware set assignments.
   b. Identification number, location, hand, fire rating, size, degree of opening, and material of each door and frame.
   c. Locations of each door hardware set, cross-referenced to floor plans, and to door and frame schedule.
   d. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
   e. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
   f. Fastenings and other installation information.
   g. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
   h. Mounting locations for door hardware.
   i. Complete list of related door devices specified or supplied in other Sections for each door and frame.

D. Riser Diagrams: Required for each opening that has electronic hardware and to incorporate the following:
1. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
2. Index of openings showing hardware set assignments.
3. Identification number, location, hand, fire rating, size, degree of opening, and material of each door and frame.
4. Locations of each door hardware set, cross-referenced to floor plans, and to door and frame schedule.

E. Door Hardware Product Data: Prepared by or under the supervision of supplier.
1. Provide an index of products used grouped by manufacturer.
2. Each product shall be highlighted or marked accordingly.

a. Do not include pages or products that are not applicable to the project. If they appear on the same page as a product being used, they shall be crossed out.

F. Samples:

1. Provide a finish sample for each exposed product in each finish specified, in manufacturer's standard size.

2. Tag Samples with full product description to coordinate samples with the door hardware schedule.

G. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

1. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
2. Complete (point-to-point) access control system block wiring diagrams.
3. Wiring instructions for each electronic component scheduled herein.

H. Closeout Submittals:

1. After final approval is received from the architect, submit a Record Copy of the Door and Hardware Schedule with all the content as previously required.
   a. Submittal must be stamped “RECORD COPY.”
   b. The Record Copy will be given to the installer for the installation of the hardware.

2. Warranty Submittal: Warranty information to include the following information:
   a. Original factory order number.
   b. Date order was placed.
   c. Date of installation (approximately if unknown).

3. Operating and Maintenance Manuals:
   a. Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

4. Wiring Diagrams:
   a. Provide “as-built” wiring diagrams with all the information as required previously.
   b. Show any modifications that were made in the field.

I. Submittals that do not comply with all the requirements above will be rejected and will have to be resubmitted. Any project delays caused by incorrect/incomplete submittals will be the responsibility of the General Contractor and Hardware Supplier.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Door Hardware Supplier Qualifications:

1. Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project.
2. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.
3. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

1.7 DELIVERY AND STORAGE

A. All hardware for field installation shall be delivered to the project site.

1. Any hardware that is required to be factory installed shall be delivered to the factory at the cost of the supplier of the doors or frames requiring the factory installation.

B. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site.

1. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
2. The storage area must maintain low humidity and a temperature between 60 to 90 degrees Fahrenheit.

C. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

D. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten (10) years for mechanical mortise locks.
2. Ten (10) years for mechanical cylindrical locks.
3. Five (5) years for mechanical exit hardware.
4. Thirty (30) years for mechanical, manual overhead door closers.
5. Two (2) years for electromechanical door hardware.

1.9 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

Part 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design".

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:
   a. Interior, Hinged Doors: 5 lbf applied perpendicular to door.
   b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
   c. Provide thresholds not more than 1/2 inch high.

d. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
e. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. For products furnished, but not installed, under this Section, Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

C. Equals: Requests for equals and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

D. Substitutions: Are not allowed unless the specified product(s) are no longer available.

2.4 HINGES

A. Hinges are to meet or exceed ANSI/BHMA A156.1 requirements.

B. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

C. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

1. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
2. Sizes from 3’1” to 4’0”: 5” heavy weight.

D. Hinge Type: Provide the type listed in the hardware sets.

E. Hinge Options:

1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

F. Manufacturers:

1. Hager Companies (HA).
2. McKinney Products (MK).
3. Stanley Hardware (ST).

2.5 CONTINUOUS HINGES

A. General Requirements:

1. Continuous Hinges are to meet or exceed ANSI/BHMA A156.26 Grade 1 Requirements.
2. Fabricated to full height of door and to template screw locations; with components finished after milling and drilling are complete.

3. Hinges are to be non-handed.
4. Factories to prepare for electrical cut-outs.
5. Hinge Type: Provide the type listed in the hardware sets.
6. Coordinate with door manufacturers for the exact type required, as it varies between door manufacturers and application.
7. Fasteners: All of the fasteners are to be fabricated from corrosion resistant materials.
   a. Provide either 12-24 x 3/4" self-drilling, thread-forming or 12-24 x 1/2" thread-forming screws that are made of 410 stainless-steel with an undercut head.
8. Electrical Options: Provide Molex style connectors on both sides of the hinge using the number of wires required for proper operation.

B. Continuous, Gear-Type Hinges:

1. Manufactured out of 6063-T6 extruded-aluminum, pin-less, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating bearings.
2. Manufacturers:

   a. Architectural Builders Hardware (AH).
   b. Hager Companies (HA).
   c. Select (SE)

2.6 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers:

1. Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware.
2. Furnish with Molex™ style standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies.
3. The type of connector shall be coordinated with the electronic hardware manufacturer being used.
4. Wire nut connections are not acceptable.
5. Manufacturers:

   a. Architectural Builders Hardware (AH) PT-1000-EZ.
   b. Securitron (SU) EL-CEPT.
   c. Stanley Hardware (ST) EPT-12C.
   d. Von Duprin (VD) EPT-10-CON.

B. Electric Door and Frame Wiring Harnesses:

1. Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening.
2. Wire nut connections are not acceptable.
3. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
4. Manufacturers:

   a. Architectural Builders Hardware (AH) EZ Series.

b. McKinney Products (MK). QC-C Series
c. Stanley Hardware (ST). WH-Series
d. Von Duprin (VD) CON Series.

2.7 SURFACE BOLTS

A. Bolts are to meet or exceed ANSI/BHMA A156.3 and A156.16, Grade 1 requirements.

B. Furnish Dustproof Strikes for all bottom bolts.

C. Provide related accessories or mounting brackets as required for appropriate installation and operation.

D. Manufacturers:

1. Architectural Builders Hardware (AH).
2. Rockwood Manufacturing (RO).
3. Trimco (TC).

2.8 OPERATING TRIM

A. Door Push Plates and Pulls: are to meet or exceed ANSI/BHMA A156.6 requirements.

B. Coordinate and provide proper width and height as required where conflicting hardware dictates.

C. Provide a minimum clearance of 2 ½" from face of door.

D. Provide Heavy Duty Concealed Fasteners where possible. Coordinate type required with door material.

E. Manufacturers:

1. Architectural Builders Hardware (AH).
2. Rockwood Manufacturing (RO).
3. Trimco (TC).

2.9 CYLINDERS AND KEYING

A. Cylinders: Original manufacturer cylinders complying with the following:

1. Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
2. Meet or exceed ANSI/BHMA A156.5 Grade 1 requirements.
3. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
4. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   a. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes. Stamped collars are not allowed.
5. Face finished to match lockset.
6. Core Type: Small format Interchangeable.
   a. CORES SUPPLIED BY OWNER, INSTALLED BY GENERAL CONTRACTOR.

B. Construction Cores:

1. Construction Cores: Provide keyed construction cores that are replaceable by permanent cores.
   a. Provide 10 construction master keys.
   b. Provide 2 Construction Core Removal Keys.

C. Key Registration List:

1. Provide transcript list in writing or electronic file (proper format) as directed by the Owner.
2. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

2.10 KEY CONTROL SYSTEM

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of change keys required for the project.

1. Manufacturer:
   a. Lund Equipment (LU).
   b. MMF Industries (MM).
   c. Telkee (TK).

2.11 MECHANICAL LOCK AND LATCHING DEVICE

A. Mortise Locksets:

1. Locks shall meet or exceed ANSI/BHMA A156.13, Series 1000, Operational Grade 1, and Security.
2. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to a minimum of 10 million cycles.
4. Lock trim and function as shown in hardware sets.
5. Manufacturers:

   a. Corbin Russwin (RU) ML2000 Series.
   b. Best (BE) 45H Series.
   c. Sargent Manufacturing (SA) 8200 Series.
   d. Schlage (SC) L9000 Series.

B. Cylindrical Locks:

1. Locks shall meet or exceed ANSI/BHMA A156.2 Series 4000 Operation Grade 1 requirements.
2. Locks are to be non-handed and fully field reversible.
3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to a minimum of 4 million cycles.
4. Lock Throw:
   a. ½” throw at single openings.
   b. ¾” throw at rated paired openings.
5. Basket:
   a. 2-3/4” unless noted otherwise.
6. Lock trim and function as shown in hardware sets.

7. Latchbolt:
   a. Provide deadlocking latchbolt for all locks with a keyed function.
8. Manufacturers:

   a. Corbin Russwin (RU) CLX3300 Series.
   b. Best (BE) 9K Series.
   c. Sargent Manufacturing (SA) 10X Line.
   d. Schlage (SC) ND Series.

2.12 LOCK AND LATCH STRIKES

A. Standards:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame.

C. Finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   a. Provide at paired openings with metal edges and astragals.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Dustproof Strikes: Provide for all bottom flush bolts or latches, exit devices, and where thermal pins are required from the door to the floor at fire rated openings.

2.13 ELECTRIC STRIKES

A. Electric strikes shall meet or exceed ANSI/BHMA A156.31, Grade 1 requirements.

1. Shall be for use on non-rated or fire rated openings.
2. Strikes shall be tested to a minimum endurance of 1 million operating cycles.
3. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified.
4. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.
5. Manufacturers:

6. HES (HS).
7. Security Door Controls (SD).
8. Trine (TR).
9. Von Duprin (VD).

2.14 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items shall meet or exceed ANSI/BHMA A156.3, Grade 1 requirements.

B. On fire rated doors, provide Exit Devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware".

C. Exit Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar.

1. Provide solid filler plate(s) where gap behind the Exit Device exists.
2. When used on full glass door applications provide a filler plate that fills in the gap between the Exit Device and the Glass.

D. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets.

1. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

E. Provide exit latches with deadlocking feature.

F. Where function of the Exit Device requires a cylinder, provide a cylinder per the requirements of the Keying System.

G. Function and Trim design as listed in the Hardware Sets.

H. Provide mounting brackets or spacers as required for proper installation and operation.

I. Where Vertical Rod Exit Devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated.

1. Provide dust proof strikes where thermal pins are required to project into the floor.

J. Extended cycle test: Devices to have been cycle tested to 10 million cycles.

K. Provide Through Bolts for All Exit Devices installed on wood doors.

L. Do not cut perimeter gasket to mount the Exit Device Strikes. Adjust template accordingly.

M. Coordinate the mounting centerline of the Exit Devices with the Door Elevations.

1. Exit Devices shall not be mounted over vision kits, unless approved by the Architect.

N. Removable Mullions:

1. On fire rated doors, provide mullions complying with NFPA 80 and UL labeling requirements.
2. Provide Key removable mullions as specified in the Hardware Sets.
   a. Cylinders to be providing per the requirements of the Keying System.
3. Provide mullion stabilizers.
4. Provide mounting brackets as required for proper installation and operation.
5. Where aluminum mullions are specified, the finish is to match the finish of the aluminum door and/or framing, submit finish color for approval.
6. Where electric strikes are used on the mullions, provide an electrical quick disconnect in the mullion along with signage stating, “Use Caution Electrical Wires Inside.”
7. When installing Mullions in Aluminum or Fiberglass Framing, install using Rivnuts and Stainless-Steel machine screws.

O. Manufacturers:

1. Corbin Russwin (RU) ED5000 Series.
2. Detex (DE) Advantex Series.
3. Sargent (SA) 80 Series.
4. Precision (PR) Apex Series.
5. Von Duprin (VD) 98XP Series.

2.15 SURFACE CLOSERS

A. Surface Closers shall meet or exceed ANSI/BHMA A156.4, Grade 1 requirements.

B. Surface Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

C. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use.

D. Provide Surface Closers complying the Americans with Disabilities Act, ANSI ICC/A117.1.

E. Extended cycle test: Surface Closers to have been cycle tested to 10 million cycles.

F. Provide metal closer covers.

G. Closers shall not be installed on exterior or corridor side of doors.

1. Where a conflict exists, bring it to the attention of the Architect prior to installation.

H. Provide accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation and operation.

I. Coordinate with Overhead Holder/Stop installation, provide special templates as required to avoid hardware conflicts.

J. When installing Mullions in Aluminum or Fiberglass Framing, install using Rivnuts and Stainless-Steel machine screws.

K. Provide Through Bolts for Surface Closers installed on wood doors.

L. Manufacturers:

1. Corbin Russwin (RU) DC8000 Series.
2. LCN (LC) 4010/4110Series.
3. Norton (NO) 9500 Series.

2.16 ELECTROMAGNETIC HOLDERS

A. Holders shall meet or exceed ANSI/BHMA A156.15, Grade 1 requirements.

B. Minimum holding force of 30 lbs.

C. Tri-voltage, field selectable 12VDC/24VDC/120VAC.

D. Provide armatures that are through bolted on all Wood Door applications.

E. Provide armature extensions as required to achieve the degree of opening required.

F. Coordinate with fire detectors and interface with fire-alarm system for labeled fire-rated door assemblies.

G. Manufacturers:

1. Architectural Builders Hardware (AH).
2. Rixson (RF).
3. Security Door Controls (SD).

2.17 OVERHEAD STOPS AND HOLDERS

A. Stops and Holders shall meet or exceed ANSI/BHMA A156.8, Grade 1 requirements.

B. Provide units that are through bolted on all Wood Door applications.

C. Coordinate with door closer installation, special templating may be required.

D. Where stops and holders are specified, coordinate with door manufacturer to insure proper application, installation, and operation.

E. Function as show in Hardware Sets.

F. Manufacturers:

1. Architectural Builders Hardware (AH).
2. Glynn Johnson (GJ).
3. Rixson (RF).

2.18 ARCHITECTURAL TRIM

A. Protective Plates (kick, armor, or mop):

1. Shall meet ANSI/BHMA A156.6 requirements.

2. Protective plates, fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80.
4. Kick and Armor Plates are to be installed on the push side of the door, unless stated otherwise.

5. Mop Plates are to be installed on the pull side of the door.

6. Size: Fabricate protection plates not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

7. Provide Plates are to be beveled on all 4 edges.

8. Height: 10”, unless noted otherwise.

9. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Products (RO).
    c. Trimco (TC).

2.19 DOOR STOPS AND HOLDERS

A. Door Stops and Holders shall comply with ANSI/BHMA A156.16, Grade 1 requirements.

B. Provide wall bumpers, either convex or concave types as required.

C. Provide Door stops with anchorage required based upon wall or floor application.

D. Do not mount floor stops where they will impede traffic.

E. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

F. Manufacturers:

1. Burns Manufacturing (BU).
2. Rockwood Products (RO).
3. Trimco (TC).

2.20 THRESHOLDS

A. Thresholds shall comply with ANSI/BHMA A156.21 requirements.

B. Thresholds shall be fabricated to full width of opening.

C. Provide non-slip surface.

D. Provide Stainless Steel Fasteners, type as detailed or required for specific floor conditions.

E. Manufacturers:

1. National Guard (NG).
2. Pemko (PE).
3. Reese (RE).

2.21 GASKETING

A. Door Gasketing shall comply with ANSI/BHMA A156.22 requirements.

B. Provide with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

C. Perimeter gasketing should not be cut around door hardware. Gaskets must maintain a continuous seal at the top and vertical edges. Adjust hardware templates accordingly.

D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

F. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

G. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:

1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
2. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
3. Gasketing on Double Doors: 0.50 cfm per foot (0.000774 cu. m/s per m) of door opening.

H. Manufacturers:

1. National Guard (NG).
2. Pemko (PE).
3. Reese (RE).

2.22 ELECTRONIC ACCESSORIES

A. Power Supplies:
1. Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies.

2. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure.

3. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw plus 50% for the specified electrified hardware and access control equipment.

4. Manufacturers:

a. Alarm Controls (AK).
b. Schlage Electronics (SC).
c. Security Door Controls (SD).
d. Securitron (SU).

2.23 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

1. The use of Aluminum or Brass/Bronze based screws is not acceptable.

C. Fasteners: Provided by door hardware manufacturer, to comply with published installation instructions, templates and as test for fire rated applications.

1. The use of other fasteners will be rejected.

2. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

3. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners.

4. Where hardware is being attached to Aluminum or FRP doors and frames Rivnuts (Rivet Nuts) and machine screws must be used.

5. Exit Devices, Surface Door Closers, Pulls, and Overhead Stops that are installed on wood doors shall be installed using through-bolts.

6. Gasket Fasteners: Provide Stainless Steel fasteners.

7. Threshold Fasteners:

a. Concrete floors: Provide ¼-20 Stainless Steel Machine Screws and Expansion Shields.
b. Wood floors: Provide #10 Stainless Steel Wood Screws.

8. Continuous Hinge Fasteners:

a. All of the fasteners are to be fabricated from corrosion resistant materials.
b. Provide either 12-24 x 3/4" self-drilling, thread-forming or 12-24 x 1/2" thread-forming screws that are made of 410 stainless-steel with an undercut head.

9. Butt Hinge Fasteners:

a. Provide screws our of steel or stainless Steel to match hinge base material.
b. Provide Wood Screws for wood door and frame applications.
c. Provide Machine Screws for metal door and frame applications.

2.24 FINISHES

A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece

are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

Part 3 – EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware.

C. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

B. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors".
3. Comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities".

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

E. Self-closing doors must close and latch completely from the fully opened position.

F. Lock Cylinders:

1. Install keyed construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as directed by Owner.

G. Thresholds: Set thresholds in full bed of sealant, and caulk around all edges, complying with requirements specified in Section 079200 "Joint Sealants."

H. Gaps: Gaps around the head and vertical edges of the doors shall meet the following requirements:

1. Wood Doors: 1/8” top, vertical edge, and in between paired doors.

2. Hollow Metal Doors: 1/8” +/- 1/16” top, vertical edge, and in between paired doors.

3. Where shimming is required to adjust the gaps the shim material must be steel. Cardboard, paper, and other materials are not acceptable.

4. Bottom of door (Undercut) shall not exceed 1” on non-rated openings and ¾” on rated openings.

I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch or cut perimeter gasketing to install other surface-applied hardware.

J. Pressure Sensitive Gasketing:

1. Do not install until the frame and door have been finished painted/stained.

2. Surface must be cleaned with alcohol wipes and dry before Gasketing is applied. Follow manufacturer’s instructions.

K. Door Bottoms: Apply to bottom of door, forming seal with floor or threshold when door is closed.

L. Door Closers: Adjust closers to follow opening forces listed under this section’s Performance Requirements.

1. Degree of opening: Template the closer to allow for the maximum degree of opening the conditions will allow.

2. Back Check valve shall be adjusted so it engages 10 degrees prior to the door reaching full swing.

3. The Latch Speed valve shall be adjusted so the door latches properly without slamming.

4. When through-bolts are used on wood doors, do not overtighten, and crush the door. If this happens the door is to be replaced.

5. Where closers or arms are installed on Aluminum or FRP doors and/or frames, install using Rivnuts (Rivet Nuts).

M. Wall Bumpers or Stops: Note that blocking in drywall partitions where wall stops, or other wall mounted hardware is located is required.

N. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Lock Strikes: Where retrofitting into existing frames, field verify the frame condition prior to ordering strikes. Field modifications to accept new strike or custom Strikes may be required.

2. Existing holes: Where holes are left from old hardware in the door and/or frame they shall repaired in compliance with NFPA80 Section 5.5.7. Finished as required by Architect.

3. Power Supplies: Location of power supplies to be coordinated with the Electrical Contractor, Fire Alarm Suppler and access control supplier.

3.4 FIELD QUALITY CONTROL

A. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating, and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

B. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
   1. Submit documentation of incomplete items in PDF electronic format.

C. Fire Door Assembly Inspection: Reference Division 01 Sections "Closeout Procedures" for stipulations requiring an initial fire door assembly inspection, including documentation reporting, upon completion of door hardware installation according to NFPA 80 Standard for Fire Doors and Other Opening Protectives, paragraph 5.2.4, requirements.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.8 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.9 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

B. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required.

C. HARDWARE SETS:

Set: 1.0

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Institutional Privacy Lock	SG V21 70 8257 LNL	US26D	SA
1	Core	Supplied by owner	US32D	SC
1	Surface Closer	4111 CYLTEL SCUSH MC TBWMS	689	LC
1	Kick Plate	K1050 10" H	US32D	RO
1	Gasketing	PK33BL		PE

Set: 2.0

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Institutional Privacy Lock	SG V21 70 8257 LNL	US26D	SA
1	Core	Supplied by owner	US32D	SC
1	Surface Closer	4111 CYLTEL EDA MC TBWMS	689	LC
1	Surface Closer	4011 MC REG or 4111 EDA as required TBWMS	689	LC
1	Kick Plate	K1050 10" H	US32D	RO
1	Stop	406	US32D	RO
1	Gasketing	PK33BL		PE

Set: 3.0

1	Continuous Hinge	A160HD	C	AH
1	Rim Exit Device, Exit Only	LD SG TB 8810 EO	US32D	SA
1	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Surface Closer	4111 MC EDA	689	LC
1	Stop	406	US32D	RO
1	Astragal Seal	By Door Manufacturer		OT
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT

Set: 4.0

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC
1	Surf Overhead Stop	9000A	US32D	AH
1	Kick Plate	K1050 10" H	US32D	RO

Set: 5.0

2	Continuous Hinge	A160HD	C	AH
1	Mullion	L980A	US28	SA
2	Rim Exit Device, Exit Only	LD SG TB 8810 EO	US32D	SA
2	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Rim Cylinder Housing	CR3040	626	RU
2	Conc Overhead Stop	1020SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC
1	Astragal Seal	By Door Manufacturer		OT
2	Door Bottom	By Door Manufacturer		OT
1	Mullion Gasket	5110BL 120"		PE
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
2	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT

Set: 6.0

1	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
1	Rim Exit Device, Electric, Storeroom	GL LD SG 56 70 8804 Less Pull	US32D	SA
2	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Flush Pull	1111C	630	TC
1	Surface Closer	4111 MC EDA	689	LC
1	Stop	406	US32D	RO
1	Door Bottom	By Door Manufacturer		OT
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Wire Harness	EZAA-12-1		AH
1	Wire Harness	EZAA-300-1		AH
1	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT

1	Reader	Supplied By Owner	OT
1	Power Supply	BPS-24-1	SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Entry allowed through the access control system.
Upon valid credentials the exit device shall unlock for 5 seconds, return to the locked state.
Remote access is allowed through access control system
Free egress at all times
upon power failure the door shall remain secure, fail secure.

Set: 7.0

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC
1	Electric Strike	4100	US32D	TR
1	Surface Closer	4111 SCUSH MC TBWMS	689	LC
1	Gasketing	PK33BL		PE
1	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT
1	Reader	Supplied By Owner		OT
1	Power Supply	BPS-24-1		SU

Notes: Theory of operation:
Door to be closed and locked at all times
entry allowed through access control system or mechanical key override.
When valid credentials are presented the electric strike shall release for 5 seconds allowing entry. After 5 seconds the electric strike will return to the secure state.
Free egress at all times.
Fail secure

Set: 8.0

1	Continuous Hinge	A160HD	C	AH
1	Rim Exit Device, Exit Only	LD SG TB 8810 EO	US32D	SA
1	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Conc Overhead Stop	1020SA	US32D	AH
1	Surface Closer	4111 MC EDA	689	LC
1	Door Bottom	By Door Manufacturer		OT
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT

Set: 9.0

1	Continuous Hinge	A160HD	C	AH
1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
2	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Conc Overhead Stop	1020SA	US32D	AH
1	Surface Closer	4111 MC EDA	689	LC
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Door Bottom	By Door Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Latch Protector	320CXL	US32D	RO

Set: 10.0

3	Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1	Push Bar	SG 8893	US32D	SA
1	Flush Pull	1111C	630	TC
1	Surface Closer	4111 MC EDA	689	LC
1	Stop	406	US32D	RO
1	Perimeter Gasket	By Frame Manufacturer		OT

Set: 11.0

2	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
2	Rim Exit Device, Electric, Exit Only	GL LD SG 56 8810 EO	US32D	SA
2	Flush Pull	1111C	630	TC
2	Conc Overhead Hold Open	1010SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC
2	Door Bottom	By Door Manufacturer		OT
1	Perimeter Gasket	By Frame Manufacturer		OT
2	Wire Harness	EZAA-12-1		AH
2	Wire Harness	EZAA-300-1		AH
1	Power Supply	BPS-24-6		SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Doors to be programmed to be unlocked as required times
Free egress at all times
Upon power failure, fire alarm or lockdown activation the exit device will lock. Fail secure

Set: 12.0

2	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
1	Mullion	L980A	US28	SA
1	Rim Exit Device, Electric, Storeroom	GL LD SG 56 70 8804 Less Pull	US32D	SA
1	Rim Exit Device, Electric, Exit Only	GL LD SG 56 8810 EO	US32D	SA
2	Core	Supplied by owner	US32D	SC
1	Rim Cylinder Housing	CR3040	626	RU
2	Flush Pull	1111C	630	TC
2	Conc Overhead Hold Open	1010SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC
2	Door Bottom	By Door Manufacturer		OT
1	Perimeter Gasket	By Frame Manufacturer		OT
2	Wire Harness	EZAA-12-1		AH
2	Wire Harness	EZAA-300-1		AH
1	Reader	Supplied By Owner		OT
1	Power Supply	BPS-24-6		SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Doors to be programmed to be unlocked as required times
Entry allowed through the access control system.
Upon valid credentials the exit device shall unlock for 5 seconds, then lock.
Remote access is allowed through access control system
Free egress at all times
Upon power failure, fire alarm or lockdown activation the exit device will lock. Fail secure

Set: 13.0

2	Continuous Hinge	A160HD	C	AH
2	Push Bar	SG 8893	US32D	SA
2	Flush Pull	1111C	630	TC
2	Conc Overhead Stop	1020SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC

Set: 14.0

2	Continuous Hinge	A160HD	C	AH
2	Surface Bolt	1825TB	US32D	AH
1	Storeroom Lock	CLX3357 NZD M16 M08 CT7SB	626C	RU
2	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Astragal Seal	By Door Manufacturer		OT

1	Perimeter Gasket	By Frame Manufacturer		OT
2	Door Bottom	By Door Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
2	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Latch Protector	320CXL	US32D	RO

Set: 15.0

2	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
1	Mullion	L980A	US28	SA
2	Rim Exit Device, Electric, Exit Only	GL LD SG 56 8810 EO	US32D	SA
2	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Rim Cylinder Housing	CR3040	626	RU
2	Flush Pull	1111C	630	TC
2	Conc Overhead Stop	1020SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC
2	Door Bottom	By Door Manufacturer		OT
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
2	Wire Harness	EZAA-12-1		AH
2	Wire Harness	EZAA-300-1		AH
2	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT
1	Power Supply	BPS-24-6		SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Doors to be programmed to be unlocked as required times
Free egress at all times
Upon power failure, fire alarm or lockdown activation the exit device will lock. Fail secure

Set: 16.0

2	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
1	Rim Exit Device, Electric, Storeroom	GL LD SG 56 70 8804 Less Pull	US32D	SA
1	Rim Exit Device, Electric, Exit Only	GL LD SG 56 8810 EO	US32D	SA
2	Core	Supplied by owner	US32D	SC
2	Flush Pull	1111C	630	TC
1	Conc Overhead Stop	1020SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC
1	Stop	406	US32D	RO
2	Door Bottom	By Door Manufacturer		OT
2	Perimeter Gasket	By Frame Manufacturer		OT

1	Threshold	253x3FG Pemkote MSES25-2	A	PE
2	Wire Harness	EZAA-12-1		AH
2	Wire Harness	EZAA-300-1		AH
2	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT
1	Reader	Supplied By Owner		OT
1	Power Supply	BPS-24-6		SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Doors to be programmed to be unlocked as required times
Entry allowed through the access control system.
Upon valid credentials the exit device shall unlock for 5 seconds, then lock.
Remote access is allowed through access control system
Free egress at all times
Upon power failure, fire alarm or lockdown activation the exit device will lock. Fail secure

Set: 17.0

1	Continuous Hinge	A160HD	C	AH
1	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
1	Mullion	L980A	US28	SA
1	Rim Exit Device, Exit Only	GL LD SG 8810 EO	US32D	SA
1	Rim Exit Device, Electric, Storeroom	GL LD SG 56 70 8804 Less Pull	US32D	SA
2	Core	Supplied by owner	US32D	SC
1	Rim Cylinder Housing	CR3040	626	RU
2	Flush Pull	1111C	630	TC
2	Surface Closer	4111 MC EDA	689	LC
2	Stop	406	US32D	RO
2	Door Bottom	By Door Manufacturer		OT
1	Astragal Seal	By Door Manufacturer		OT
1	Mullion Gasket	5110BL 120"		PE
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Wire Harness	EZAA-12-1		AH
1	Wire Harness	EZAA-300-1		AH
2	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT
1	Reader	Supplied By Owner		OT
1	Power Supply	BPS-24-6		SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Doors to be programmed to be unlocked as required times

Entry allowed through the access control system.
Upon valid credentials the exit device shall unlock for 5 seconds, then lock.
Remote access is allowed through access control system
Free egress at all times
Upon power failure, fire alarm or lockdown activation the exit device will lock. Fail secure

Set: 18.0

1	Continuous Hinge	A160HD	C	AH
1	Continuous Hinge	A160HD 083 EA12-EZAA	C	AH
1	Mullion	L980A	US28	SA
1	Rim Exit Device, Exit Only	GL LD SG 8810 EO	US32D	SA
1	Rim Exit Device, Electric, Storeroom	GL LD SG 56 70 8804 Less Pull	US32D	SA
3	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU
1	Rim Cylinder Housing	CR3040	626	RU
2	Flush Pull	1111C	630	TC
2	Conc Overhead Stop	1020SA	US32D	AH
2	Surface Closer	4111 MC EDA	689	LC
1	Astragal Seal	By Door Manufacturer		OT
1	Mullion Gasket	5110BL 120"		PE
1	Perimeter Gasket	By Frame Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Wire Harness	EZAA-12-1		AH
1	Wire Harness	EZAA-300-1		AH
2	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT
1	Request to Exit	Supplied By Owner		OT
1	Power Supply	BPS-24-1		SU

Notes: Theory of operation:
Door to be closed and locked at all times.
Doors to be programmed to be unlocked as required times
Entry allowed through the access control system.
Upon valid credentials the exit device shall unlock for 5 seconds, then lock.
Remote access is allowed through access control system
Free egress at all times
Upon power failure, fire alarm or lockdown activation the exit device will lock. Fail secure

Set: 19.0

1	Continuous Hinge	A160HD	C	AH
1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC
1	Stop	406	US32D	RO

1	Perimeter Gasket	By Frame Manufacturer		OT
1	Door Bottom	By Door Manufacturer		OT
1	Threshold	253x3FG Pemkote MSES25-2	A	PE
1	Door Contact	DAY7G/ST-DBD (Supplied by Owner)		OT

Set: E1

1	Core	Supplied by owner	US32D	SC

Set: E2

2	Core	Supplied by owner	US32D	SC

Set: E3

1	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU

Set: E4

1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC

Set: E5

1	Classroom Intruder Lock	CLX3352 NZD M08 CT7SB	626C	RU
2	Core	Supplied by owner	US32D	SC

Set: E6

1	Classroom Lock	CLX3355 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC

Set: E7

1	Core	Supplied by owner	US32D	SC
1	Rim Cylinder Housing	CR3040	626	RU

Set: E8

2	Core	Supplied by owner	US32D	SC
2	Rim Cylinder Housing	CR3040	626	RU

Set: E9

1	Entrance Lock	CLX3351 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC

Set: E10

1	Passage Latch	CLX3310 NZD	626C	RU

Set: E11

3	Core	Supplied by owner	US32D	SC
1	Mortise Cylinder Housing	CR1040	626	RU

Set: E12

3	Core	Supplied by owner	US32D	SC

Set: E13

5	Core	Supplied by owner	US32D	SC

Set: E14

4	Core	Supplied by owner	US32D	SC

Set: E15

1	Privacy Lock	CLX3320 NZD	626C	RU

Set: E16

1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC
1	Lock Converstion	4-2-CW	32D	DJ

Set: E17

1	Classroom Intruder Lock	CLX3352 NZD M08 CT7SB	626C	RU
2	Core	Supplied by owner	US32D	SC
1	Lock Converstion	4-2-CW	32D	DJ

Set: E18

1	Lock Sub Front	08-0562	26D	SA
1	Storeroom Lock	CLX3357 NZD M08 CT7SB	626C	RU
1	Core	Supplied by owner	US32D	SC

Set: E19

1	Surface Bolt	1825TB	US32D	AH

Set: E20

2	Core	Supplied by owner	US32D	SC
2	Mortise Cylinder Housing	CR1040	626	RU

SECTION 088000 - GLAZING

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows (Factory glazed).

2. Doors (Interior & Exterior)

3. Interior vision lites.

4. Glazing with impact resistant security film (S)

1.3 RELATED REQUIREMENTS

A. SECTION 088810 “Fire Rated Glass and Framing” for fire rated glass in rated glass and frame assemblies per plan.

1.4 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.5 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but

not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

2. Design Wind Pressures: As indicated on Drawings.

3. Design Snow Loads: As indicated on Drawings.

4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, provide glass to resist design wind pressure based on glass type factors for short-duration load.

5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick

2. For laminated-glass lites, properties are based on products of construction indicated.

3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).

5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

2. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.7 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.

1. Insulating glass.

2. Silicone-Coated Spandrel glass.

3. Fire-Rated glass.

C. Glazing Accessory Samples: For gaskets, in 12-inch (300-mm) lengths.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings glass testing agency and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for coated glass, insulating glass, glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain ultraclear float glass, coated float glass, laminated glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."

3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies. All safety glazing labeling shall comply with CPSC-16, CFR 1201.

I. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

2. Review temporary protection requirements for glazing during and after installation.

L. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install glazing in mockups specified in Division 08 Section "Aluminum Windows" to match glazing systems required for Project, including glazing methods.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: **10 years** from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: **10 years** from date of Substantial Completion.

2.0 PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

A. Strength: Where float glass is indicated, provide Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

B. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For insulating-glass units, properties are based on units of thickness indicated `

C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2. For uncoated glass, comply with requirements for Condition A.

3. For coated vision glass, comply with requirements for Condition C (other coated glass).

D. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Trulite or Architect approved equal.

2. Glass: Clear float.

3. Ceramic Coating Color: As selected by Architect from manufacturer's full range. Silicone paint will not be accepted.

2.2 MONOLITHIC-GLASS TYPE

A. Glass Type **MG-1**: bullet resistant laminated tempered float glass.

1. Location: Interior door and window glazing unless otherwise noted.

2. Thickness: 5/16".

3. Provide safety glazing labeling.

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.

2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

3. Interlayer Color: Clear unless otherwise indicated.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 LAMINATED BALLISTIC GLASS

a. Shooter/attack/blast resistant security glass.

b. Basis-of-Design product:

2. Armoured One – Model AOTSG616L 5/16" Tactical Security Glass

3. WEY-SA-C2 – Standard for shooter/attack certification and forced entry Class 2.

4. GSA Level C – General Services Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings.

5. ASTM F1642 – Standard Test Method for Glazing and Glazing Systems Subject to Air blast Loadings.

6. UL972 – Standard for Burglary Resisting Glazing.

7. EN356 P4 – Testing and Classification of Resistance against manual attack.

8. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

9. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Consumer Products Safety Commission; current edition.

10. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

2.5 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. PPG Industries,

2. Guardian.

3. Trulite

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary.

2. Structural Spacer: stainless steel grey technoform warm edge spacer with desiccant all four sides. U-channel with exposed desicant spacer will not be accepted.

a. Products: Subject to compliance with requirements, provide the following or Architect approved equal:

1) Technoform / Trulite

3. Desiccant: As recommended by spacer manufacturer.

2.6 SECURITY GLAZING FILM

A. MANUFACTURERS

1. Armoured One LLC: www.ArmouredOne.com

a. Tactical Security Film AOTSF23 (23 Mil).

2. Requests for substitutions will be considered in accordance with provisions in Division 01.

3. Warranty:

a. Provide a **15 year** manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

B. Security Glazing Film: Provide factory/shop applied film to new glazing assemblies and field glazing assemblies to provide impact resistance and forced/attack resistance complying with WEY-SA-C1, ANSI Z97. I and CPSC 16 CFR 1201 Category II, ASTM E330, UL972, EN356 P4A, and GSA Level C as specified:

1. Applied to glazing as specified in specification section 088810; Fire Resistive Openings.

2. Surface applied film.

3. Provide supplemental structural sealant and trim anchoring system as required to meet forced entry resistance requirements.

C. MATERIALS

2.7 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.

2. EPDM complying with ASTM C 864.

3. Silicone complying with ASTM C 1115.

4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.8 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service

and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790.

b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.

c. May National Associates, Inc.; Bondaflex Sil 290.

d. Pecora Corporation; 890.

e. Sika Corporation, Construction Products Division; SikaSil-C990.

f. Tremco Incorporated; Spectrem 1.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.9 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.

2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.10 FIRE-RATED GLAZING PRODUCTS

A. Fire-Rated, Safety-Rated Transparent Wall Panel Glass **(FR-S)**: safety-rated glazing material that complies with NFPA 252 (Door Assemblies), NFPA 257 (Window Assemblies) – if any, CPSC 16FR1201 (Category I or II) fire rating and as follows:

1. Fire-Protection Rating: 45 min. for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

2. Products: Subject to compliance with requirements, provide one of the following:

3. Pilkington Group Limited (distributed by Technical Glass Products); PyroStop:

4. Composition: Composed of multiple sheets of “Optiwhite” high visible light transmission glass laminated with an intumescent interlayer

5. Safi First; SuperLite II-XL.

2.11 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.12 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.13 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type (**IG-1**): Category II, Double glazed, low-e-coated, clear insulating glass.

1. Location: Exterior glazing where indicated

2. Overall Unit Thickness: 1 inch.

3. Thickness of Lites: ¼".

a. Outdoor Lite: Tinted fully tempered float glass

1) Tint Color: Solargray Tempered (final match to be determined in the field)

b. Interspace Content: Argon.

c. Indoor Lite: Ultraclear fully tempered float glass.

4. Interspace Content: Argon.

5. Low-E Coating: second surface.

6. Visible Light Transmittance: 60% percent minimum.

7. Winter Nighttime U-Factor: .20 maximum.

8. Solar Heat Gain Coefficient: .26 maximum.

9. Provide safety glazing labeling.

a. Note: At Category I locations standard float glass to be used in matching colors listed above.

B. Glass Type **(IG-S)** Category II, Double glazed, low-e-coated, clear insulating glass, fully tempered with integral security film.

1. Overall Unit Thickness: 1 inch (25 mm)

2. Thickness of Each Glass Lite: 6.0 mm

a. Outdoor Lite: Tinted fully tempered float glass

1) Tint Color: Solargray Tempered (final match to be determined in the field)

b. Interspace Content: Argon.

c. Indoor Lite: Fully tempered float glass

1) Impact Resistant Security film (4th Surface)

2) Basis-of-Design Manufacturer: Armoured One or Equal

3) Product Series: AOTSF23

4) Thickness: 23mil (460 microns), four ply

5) Warranty: Limited lifetime

6) Note: Post installed film is not acceptable at locations of new glass.

3. Low-E Coating: Softcoat on second surface.

4. Visible Light Transmittance: 54 percent minimum.

5. Winter Nighttime U-Factor: 0.24 maximum.

6. Summer Daytime U-Factor: maximum.

7. Solar Heat Gain Coefficient: 0.29 maximum.

8. Provide safety glazing labeling.

C. Glass Type **(IG-2)** Silicone-coated, insulating spandrel glass, fully tempered with .040 Closure Panel.

1. Overall Unit Thickness: 1 inch (25 mm)

2. Thickness of Each Glass Lite: 6.0 mm

3. Thickness of Lites: ¼".

a. Outdoor Lite: Tinted fully tempered float glass

1) Tint Color: Solargray Tempered (final match to be determined in the field)

b. Interspace Content: Argon.

4. Indoor Lite: Fully tempered float glass with opaque ceramic coating

1) Color: Gray

2) Back: With .040 Aluminum back closure panel at indoor light to provide interior finish surface. Color selected from full range

5. Winter Nighttime U-Factor: 0.24 maximum.

6. Summer Daytime U-Factor: maximum.

D. Glass Type (**IG-3**): Double Glazed, Low-e-coated, Low Iron, Frit Pattern Insulating Vision glass.

1. Basis-of-Design Product: Guardian Glass, LLC; SunGuard **SNX 62/27 on UltraClear with 50% White Dot Frit Pattern** or approved equal.

2. Overall Unit Thickness: 1 inch.

3. Minimum Thickness of Each Glass Lite: 6.0 mm.

4. Outboard Lite: Fully tempered Guardian UltraClear float glass.

1) Low-e Coating Sputtered on #2 Surface: Guardian SunGuard SNX 62/27.

5. Interspace: Argon filled, 12 mm (1/2 inch) wide, hermetically sealed.

6. Inboard Lite: Fully tempered Guardian UltraClear float glass.

1) Frit Pattern on #3 Surface: 50% white dot frit pattern.

7. Glass Unit Performance Values:

a. Visible Light Transmittance: 30 percent minimum.

b. Winter Nighttime U-Factor: 0.18 maximum.

c. Summer Daytime U-Factor: 0.17 maximum.

d. Solar Heat Gain Coefficient: 0.20 maximum.

8. Provide safety glazing labeling.

E. Insulated Metal Glazing Panels with .040 Closure Panel (**IG-4**)

1. Overall Unit Thickness: 1 inch (25 mm)

2. Finish: Kynar 500 Metallic Colors from the full range

3. Substrate: 1/8” hardboard

4. Core: 5/8” expanded polystyrene (EPS foam board.

5. Back: With .040 Aluminum back closure panel at indoor light to provide interior finish surface.

   a. Color: Selected from the full range

2.14 IMPACT-RESISTANT SECUIRTY FILM PRODUCT (F) AT EXISTING WINDOWS AND DOORS (E)

A. Basis-of-Design Manufacturer: Armoured One, LLC., Which is located at: 386 North Midler Ave. Syracuse, NY 13206. Tel: 315-720-4186; Email: info@armouredone.com; Web: www.armouredone.com.

1. Or approved equivalent product.

2. Location: At existing interior/exterior systems where noted on drawings. Post installed film is only acceptable at existing systems only.

3. Glazing Film: Transparent polyester film for permanent bonding to glass.

   a. Thickness: 0.023 inch, minimum. Must be a single layer film. Multi-layering film to achieve thickness is not acceptable.

4. Color: Clear.

   a. Adhesive Type: Pressure sensitive.

   b. Tensile Strength: ASTM D-882, 32,000 psi minimum.

   c. Breaking Strength: ASTM D-882, 640 lbs / inch.

   d. Elongation at Break: ASTM D-882, 230%

   e. Visible Light Transmission: 87%

   f. UV Block: >99%

   g. U-Value Winter: 1.03

   h. Shading Coefficient: 0.93

   i. Glare Reduction: 3%

   j. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).

   k. Light Transmission of Film Applied on 1/4-inch-thick Clear Annealed Glass:

      1) Visible light Transmittance: 86 percent.

5. Anchoring System: DOW 995 or GE SCS2000 SilPruf Structural Sealant with high impact styrene trim.

PART 3 - EXECUTION

2.15 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep systems.

3. Minimum required face and edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.16 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

2.17 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

2.18 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

2.19 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

2.20 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

2.21 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

2.22 FILM VERIFICATION FOR SECURITY GLAZING FILMS

A. Awarded contractor will be required to verify that film installed meets the requirements highlighted in this bid. By submitting a bid, you as the contractor understand that three pieces of glass, chosen at random will be removed and film applied will be measured to verify that film installed meets specifications as requested. Film may need to be removed as part of the verification process.

2.23 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088810 - FIRE RESISTIVE OPENINGS & GLAZING

1.0 PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing fire resistive, temperature rise, framing system with aluminum or decorative cladding for 45-120 minute.

2. Applications of fire rated framing includes:

a. Vision lites in fire rated doors, full vision fire rated doors, sidelites, borrowed lites, windows, transoms and transparent walls with fire rating requirement as specified.

B. Related Sections:

1. Section 013323: Shop Drawings, Product Data and Samples.
2. Section 081600: FRP/Aluminum Hybrid Doors.
3. Section 084113: Aluminum-Framed Entrances and Storefronts.
4. Section 085653: Security Windows
5. Section 087100: Finish Hardware.
6. Section 088000: Glazing.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
2. ASTM E152 Methods of Fire Tests of Door Assemblies.
3. ASTM E163 Methods for Fire Tests of Window Assemblies.
4. ASTM E2074: Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
5. ASTM E2110-1: Standard Test for Positive Pressure of Fire Tests of Window Assemblies.
6. ASTM E283-04: Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
7. ASTM 547-00: Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Difference.
8. ASTM E331-00: Standard Test Method for Metal Curtain Walls and Doors by Uniform Static Air Pressure Difference.

9. ASTM E330-02: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

10. ASTM F 588-04: Test Method for Resistance of Window Assemblies to Forced Entry Excluding Glazing.

B. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.

2. NFPA 251: Fire Tests of Building Construction and Materials.

3. NFPA 252: Fire Tests of Door Assemblies.

4. NFPA 257: Fire Tests of Window Assemblies.

C. Underwriters Laboratories, Inc. (UL):

1. UL 9: Standard for Safety of Fire Tests of Window Assemblies.

2. UL 10B: Standard for Safety of Fire Tests of Door Assemblies.

3. UL 10C: Standard for Safety of Positive Pressure Fire Tests of Door Assemblies.

4. UL 263: Fire Tests of Building Construction and Materials.

5. UL 752-2005: Standard for Safety for Bullet-Resisting Equipment.

D. Standard Council of Canada (ULC):

1. ULC Standard CAN4-S101: Fire Tests of Building Construction and Materials.

2. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.

3. ULC Standard CAN4-S106: Fire Tests of Window Assemblies.

E. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

F. American National Standards Institute (ANSI):

1. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

G. Glass Association of North America (GANA)

1. GANA – Glazing Manual.

2. FGMA – Sealant Manual.

H. National Fenestration Rating Council (NFRC)

1. NFRC 100: Procedure for Determining Fenestration Product U-Factors.

2. NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

I. American Recovery and Reinvestment Act

1. Section 1605, Title XVI Buy American Provision]

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Fire Rating: must meet 20, 45, or 60-minutes as specified.

2. Fire Resistive Wall Assembly Certifications: must meet 60-120 minute fire resistive wall assemblies tested in accordance with ASTM E119, NFPA 251, UL 263 and ULC-S101.

3. Fire Resistive, Temperature Rise Door Assembly Certifications: must meet 60-90 minute fire resistive temperature rise door assemblies tested in accordance with NFPA 252, UL 10B, UL 10C and CAN4 S104. Must meet 250 degrees F/450 degrees F temperature rise door requirements.

4. Fire Protective Door Assembly Certifications: must meet 20-45 minute fire protective door assemblies shall be tested in accordance with NFPA 80, NFPA 252, ASTM E152, ASTM E2074, UL 10B, UL 10C and CAN4-S104.

5. Fire Protective Window Assembly Certifications: must meet 20-45 minute fire protective window assemblies shall be tested in accordance with NFPA 80, NFPA 257, ASTM E163, ASTM E2010, UL 9 and CAN4-S106.

6. Air Infiltration: must meet <0.01 cfm/ft^2

7. Water Resistance Test Pressure: up to 20.0 psf

8. Uniform Load Deflection Test Pressure: up to +/- 50.0 psf

9. Uniform Load Structural Test Pressure: up to +/- 75.0 psf

10. Testing Laboratory: Fire test must be conducted by a nationally recognized independent testing laboratory.

11. Glazing: Fire protective glazing in 20-45 minute fire protective doors and openings up to the maximum size tested. Fire resistive glazing that meets ASTM E-119/UL 263/ULC-S101 up to the max. size tested. All glazing used in doors, sidelites or any hazardous location must meet CPSC Cat. I or II impact safety.

B. Listings and Labels:

1. Fire resistive, temperature rise framing system shall be under current follow-up service by a nationally recognized independent laboratory approved by OSHA and maintain a

current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

C. Appearance:

1. Fire rated wall/door assembly shall have a neat finished appearance with minimum joints at decorative cover intersections.

1.4 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.

1. Shop Drawings: Submit shop drawings showing layout, profiles, and product components.

2. Samples: Submit samples for finishes, colors, and textures.

3. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, and installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials to specified destinations in manufacturer's or distributor's packaging undamaged, complete with installation instructions.

D. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.6 FABRICATION DIMENSIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.7 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is not intended to limit other rights that the Owner may have under the Contract Documents.

1. Warranty Period: 5 years from date of shipping.

2.0 PART 2 - PRODUCTS

2.4 FIRE-RATED GLAZING MATERIALS **(FR)**

A. Glass type Basis of Design: Superlite II-XL-45

B. Properties:

1. Individual Lites shall be permanently identified with a listing mark.

2. Glazing material installed in "Hazardous Locations" (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used in Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.

3. Temperature rise on the unexposed side of glazing material shall be limited to 250 degrees Fahrenheit when required.

C Logo: Each piece of fire rated glazing shall be labeled with a permanent logo.

2.5 FABRICATION

A. Assemblies shall be furnished knocked down for field assembly and will be glazed in the field.

B. Door assemblies shall be factory prepared for field mounting of hardware.

C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance. Obtain approved shop drawings prior to fabrication.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.

B. Frames and 20-minute doors Clear Anodized: AA-M12C22A21, etched, medium matte, clear anodic coating.

C. Steel Doors: high performance Coraflon fluoropolymer finishes by PPG to match clear anodized aluminum finish.

3.0 PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data including product technical bulletins and installation instructions.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, have been previously installed under other sections, and are acceptable for product installation in accordance with manufacturer's instructions. Openings shall be plumb, square and within allowable tolerances. The

Architect/Engineer shall be notified of any conditions that jeopardize the integrity of the proposed fire wall/door framing system. Do not proceed until such conditions are corrected.

3.3 INSTALLATION

A. Fire wall/door installation shall be by a licensed contractor and in strict accordance with the approved shop drawings.

3.4 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

B. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

C. Remove temporary coverings and protection of adjacent work areas.

D. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

B. Related Requirements:

1. Section 092216 “Non-Structural Metal Framing.”

2. Section 092900 “Gypsum Board.”

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

B. Do not install finish panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: **1 hour**.

B. STC Rating: **51, minimum**.

C. Gypsum Shaftliner Board:

1. Moisture- and Mold-Resistant Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of 10 as rated according to ASTM D3274, 1 inch (25.4 mm) thick, and with double beveled long edges.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1) American Gypsum.
2) CertainTeed Corporation.
3) CertainTeed Gypsum.
4) Continental Building Products, LLC.
5) Georgia-Pacific Gypsum LLC.
6) National Gypsum Company.
7) PABCO Gypsum.
8) USG Corporation.

D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.

1. Protective Coating: **ASTM A653/A653M, G40 (Z120), hot-dip galvanized** unless otherwise indicated.

E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:

1. Depth: **4 inches (102 mm).**

2. Minimum Base-Metal Thickness: **0.033 inch (0.84 mm)**.

F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least **2-1/2 inches (64 mm)** long and matching studs in depth.

1. Minimum Base-Metal Thickness: **Matching steel studs**.

G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

H. Finish Panels: **Cementitious backer units as specified Section 093013 "Ceramic Tiling."**

I. Sound Attenuation Blankets: As specified in **Section 092216 "Non-Structural Metal Framing."**

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in **Section 092900 "Gypsum Board"** that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

E. Reinforcing: Galvanized-steel reinforcing strips with **0.033-inch (0.84-mm)** minimum thickness of base metal (uncoated).

F. Acoustical Sealant: Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints **according to ASTM C840 and in specific locations approved by Architect** while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

2. Sound Batt Insulation for use in interior partitions.

3. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 092116.23 “Gypsum Board Shaft Wall Assemblies.”

2. Section 092900 “Gypsum Board.”

3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATION SUBMITTALS

A. Evaluation Reports: For firestop tracks, from ICC-ES.

2.0 PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.

2) MBA Building Supplies; Slotted Deflecto Track.

3) Steel Network Inc. (The); VertiTrack VTD Series.

4) Superior Metal Trim; Superior Flex Track System (SFT).

5) Telling Industries; Vertical Slip Track.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.

b. Grace Construction Products; FlameSafe FlowTrak System.

c. Metal-Lite, Inc.; The System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

2. Depth: As indicated on Drawings.

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

J. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SOUND BATT INSULATION

A. Quiet Zone Acoustic Batts by Owens Corning or Equal

1. A. Type: Kraft faced glass fiber acoustical insulation complying with ASTM C 665, Type II, Class C.

B. Size: To match wall dimensions

C. Fire Resistance Rating: Passes ASTM 119 as part of a complete fire tested wall assembly.

D. Sounds Transmission Class: 49

2.4 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Post-installed, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.

2. Steel Studs and Runners: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.

a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.

2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16 inches (406 mm) 400 mm o.c. unless otherwise indicated.

b. Multilayer Application: 16 inches (406 mm) 400 mm o.c. unless otherwise indicated.

c. Tile Backing Panels: 16 inches (406 mm) 400 mm o.c. unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb unless otherwise indicated.

b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Firestop Track: Where indicated, install to maintain continuity of fire-

resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Z-Furring Members:

1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c., unless noted otherwise.

2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support

standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to steel roof deck.

5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

2. Exterior gypsum board for ceilings and soffits.

B. Related Requirements:

1. Section 079200 “Joint Sealants” for acoustical sealants associated with gypsum board assemblies.

2. Section 092116.23 “Gypsum Board Shaft Wall Assemblies.”

3. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

4. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

2.0 PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CertainTeed Corp.

2. Georgia-Pacific Gypsum LLC.

3. National Gypsum Company.

4. USG Corporation.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).

2. Long Edges: Tapered.

3. Location: As noted on drawings

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2. Shapes:

a. Cornerbead.

b. Bullnose bead.

c. LC-Bead: J-shaped; exposed long flange receives joint compound.

d. L-Bead: L-shaped; exposed long flange receives joint compound.

e. U-Bead: J-shaped; exposed short flange does not receive joint compound.

f. Expansion (control) joint.

g. Fire rated control joints; FAS-093 fire rated control joint by Clark Dietrich or Architect approved equal.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.

2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.

2. LC-Bead: Use at exposed panel edges, unless noted otherwise.

3. L-Bead: Use where indicated.

4. U-Bead: Use where indicated.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 2: Panels that are substrate for tile.

2. Level 5: At panel surfaces that will be exposed to view and where gloss/semi-gloss, enamel or non-textured flat paints are applied.

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

b. Refer to Finish Schedules for paint types and/or wall coverings.

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed ceramic wall tile.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

2. Section 092900 "Gypsum Board" for cementitious backer units.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.

2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches (300 mm) square but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.

3. Full-size units of each type of trim and accessory for each color and finish required.

4. Metal edge strips in 6-inch (150-mm) lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association

2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.

3. Installer employs only Ceramic Tile Education Foundation Certified Installers for Project.

4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of large format tile.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.

2. Build mockup of each type of wall tile installation.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Waterproof membrane.

2. Crack isolation membrane.

3. Cementitious backer units.

4. Metal edge trims.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Glazed Ceramic Tile **(GCT-1 and 2)**

1. Basis of Design Product: Subject to compliance with requirements, provide **Iris Ceramica; "Aura"**, or Architect approved equal product.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 4 by 12 inches (101.6 by 304.8 mm).
4. Thickness: 5/16 inch (7.9 mm).
5. Face: Plain with square edges.
6. Dynamic Coefficient of Friction: Not less than 0.42.
7. Tile Color, Glaze, and Pattern: As indicated on the Finish Legend.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Provide bullnose tile wall base where indicated on drawings and where no wall tile is scheduled with new floor tile.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. Corners and tops of wall tile: **Schluter Systems; Rondec or Equal by Laticrete**. To be installed at all external corners and locations where cut edge of tile is exposed and top of wall tile where tile doesn't extend to the ceiling.
        1) Provide Stainless Steel Type 316L within pool area and adjacent pool locker rooms (team room), toilet rooms, changes rooms, offices, lobby and viewing platform.
        2) Provide Satin anodized aluminum at all other locations unless otherwise noted.

B. Porcelain Tile **(GCT-3)** Unglazed.

1. Basis of Design Product: Subject to compliance with requirements, provide **Daltile; "Multitude",** or Architect approved equal product.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12 by 24 inches (304.8 by 609.6 mm).
4. Thickness: 3/8 inch (9.3 mm).
5. Face: Plain with square edges.
6. Dynamic Coefficient of Friction: Not less than 0.42.
7. Tile Color, Glaze, and Pattern: As indicated on the Finish Legend.
8. Grout Color: As selected by Architect from manufacturer's full range.

9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. See Trim Descriptions at Glazed Ceramic Tile types GCT-1 and GCT-2.

C. Glazed Ceramic Tile **(GCT-4)**

1. Basis of Design Product: Subject to compliance with requirements, provide **Iris Ceramica; "Slide"**, or Architect approved equal product.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 4 by 12 inches (101.6 by 304.8 mm).
4. Thickness: 5/16 inch (7.9 mm).
5. Face: Plain with square edges.
6. Dynamic Coefficient of Friction: Not less than 0.42.
7. Tile Color, Glaze, and Pattern: As indicated on the Finish Legend.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. See Trim Descriptions at Glazed Ceramic Tile types GCT-1 and GCT-2.

D. Glazed Ceramic Tile **(GCT-5)**

1. Basis of Design Product: Subject to compliance with requirements, provide **American Olean; "Color Story Wall"**, or Architect approved equal product.
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 4 by 4 inches (101.6 by 101.6 mm).
4. Thickness: 5/16 inch (7.9 mm).
5. Face: Plain with square edges.
6. Dynamic Coefficient of Friction: Not less than 0.42.
7. Tile Color, Glaze, and Pattern: As indicated on the Finish Legend.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. Corners: **Schluter Systems; Jolly**. To be installed at all external corners and locations where cut edge of tile is exposed.

2.4 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4
1. Manufacturers: Subject to compliance with requirements, provide **Laticrete International, Inc.; "253 Gold"** or Architect approved equal product.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4, provide **Laticrete 4XLT**.

2.5 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7. Color as selected from manufacturer's full range of color samples.
   1. Unsanded grout mixture for joints 1/8" and narrower.
   2. Sanded grout mixture for joints 1/8" and wider.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   1. Laticrete International, Inc. or Architect approved equal.

2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants".

   1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

   2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.

C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; Satin Anodized Aluminum. ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.

b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Tile floors in wet areas.

b. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.

3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Glazed Wall Tile: 3/16 inch (4.7625 mm).

2. Porcelain Tile: 1/4 inch (6.4 mm).

3. Patching of existing glazed Wall Tile: Match existing adjacent grout joints

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

J. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

4.0 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Metal Studs:
   1. Tile Installation TCNA W244C-19; thinset mortar on cement board.
      a. Tile Type: **GCT-5**
      b. Thinset Mortar: Latex-portland cement mortar.
      c. Grout: Polymer-modified unsanded grout.

B. Interior Wall Installations, Masonry:
   1. Tile Installation TCNA W202I-18; thinset mortar.
      a. Tile Type: **GCT-1, GCT-2, GCT-3, GCT-4**
      b. Thinset Mortar: Latex-portland cement mortar.
      c. Grout: Polymer modified unsanded grout.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- (150-mm-) long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.

a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:

a. Lighting fixtures.
b. Diffusers.
c. Grilles.
d. Speakers.
e. Sprinklers.
f. Access panels.
g. Perimeter moldings.

7. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage

from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS **(ACT-1)**

A. Basis of Design Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Optima #3251**, or Architect approved equal.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type B, glass-fiber base with membrane-faced overlay; Form B2, cloth. Binder shall not contain urea formaldehyde.
2. Pattern: G (smooth).
3. Fire Class: A

C. Color: White.

D. Light Reflectance (LR): Not less than 0.88.

E. Noise Reduction Coefficient (NRC): Not less than 0.95.

F. Articulation Class (AC): Not less than 190.

G. Edge/Joint Detail: 9/16” square tegular.

H. Thickness: 1 inch (25 mm).

I. Modular Size: 24 by 24 inches (610 by 610 mm).

2.4 ACOUSTICAL PANELS **(ACT-2)**

A. Basis of Design Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Ultima High NRC #2082**, or Architect approved equal.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type IV glass-fiber base with membrane-faced overlay; Form 2, cloth. Binder shall not contain urea formaldehyde.
2. Pattern: E (smooth).
3. Fire Class: A

C. Color: White.

D. Light Reflectance (LR): Not less than 0.87.

E. Noise Reduction Coefficient (NRC): Not less than 0.85.

F. Ceiling Attenuation Class (CAC): 35

G. Articulation Class (AC): Not less than 170.

H. Edge/Joint Detail: 9/16” beveled tegular.

I. Thickness: 1 inch (25 mm).

J. Modular Size: 24 by 24 inches (610 by 610 mm).

2.5 METAL SUSPENSION SYSTEM **(For ACT-1 & ACT-2)**

A. Basis of Design Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Prelude XL**, grid system or Architect approved equal.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (23-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Color and Finish: Blizzard White.
6. Cap Finish: Painted white.

2.6 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.

    a. Type: Post-installed expansion anchors.
    b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
    c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
    d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Angle Hangers: Angles with legs not less than 7/8-inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

E. Hold-Down Clips: Manufacturer's standard hold-down.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

2.7 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
4. For soffits with elevation change from existing ceiling provide **AXOIM Straight Transition**. Height to Match elevation shown on drawings.

2.8 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C636/C636M**,** seismic design requirements, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
3. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
   a. Hold-Down Clips: Space 24 inches (610 mm) o.c. on all cross runners.
5. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoset-rubber base including vented cove base
2. Rubber molding accessories.
3. Rubber stair tread and riser

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE **(RB-1)**

A. Basis of Design: Subject to compliance with requirements, provide **Roppe; "Pinnacle Rubber Base"** or Architect approved equal product.

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:
   a. Style B, Cove: Provide in all areas with resilient and carpet tile floor coverings.

C. Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As indicated on the Finish Legend.

2.2 RUBBER MOLDING ACCESSORY **(USED W/ CPT-1)**

A. Basis of Design Subject to compliance with requirements, provide **Roppe; Rubber Transition Strip** or Architect approved equal product.

B. Description: Rubber transition strip for tile/carpet joiner.

C. Locations:
1. Where new carpet tile meets adjacent tile flooring.

D. Colors and Patterns: Match rubber base.

2.3 RUBBER STAIR TREAD **(RF-1)**

A. Basis of Design: Subject to compliance with requirements, provide **Tarkett, Johnsonite Angle Fit Rubber Stair Tread with Integrated Riser**, or Architect approved equal product.

B. Description: Pre-shaped stair covering with integral stair nosing, riser, and tread with grit tape. Include CFS-00-A Cove Filler Strip where the tread and riser intersect.

C. Profile and Dimensions: As indicated on the drawings.

D. Locations: As indicated on the Finish Schedule.

E. Colors and Patterns: As indicated on the Finish Legend.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish, nominal 2 inches (50.8 mm) wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

    a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Luxury vinyl floor tile (LVT).
   2. Vinyl Composition Tile (VCT).

B. Related requirements:
   1. Section 03 “Hydraulic Cement Underlayment” for preparation of floor slab prior to resilient tile installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

   1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   2. Show details of special patterns.

C. Samples: Full-size units of each color, texture, and pattern of floor tile required.

   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

D. Samples for Initial Selection: For each type of floor tile indicated.

E. Samples for Verification: Full-size units of each color and pattern of floor tile required.

   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

F. Welded-Seam Samples: For seamless-installation technique indicated and for each floor covering product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.

G. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required. Rubber Floor Installers must attend Nora Academy and provide documentation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE **(LVT-1 through 3)**

A. Basis of Design: Subject to compliance with requirements, provide **Interface; "Scorpio"** or Architect approved equal product.

B. Tile Standard: ASTM F1700.
1. Class: Class III, Printed film vinyl tile.
2. Type: B.

C. Wearing Surface: Smooth.

D. Thickness: 4.5 mm.

E. Wear Layer Thickness: 22 mil.

F. Size: 19.69 by 19.69 inches (50 by 50 cm).

G. Shape:
1. Standard square shapes. Refer to Floor Finish Plans for locations and quantities.

2. Custom angled shapes to be factory cut. Refer to Floor Finish Plans for locations and quantities.

H. Colors: As indicated on the Finish Legend.

I. Installation Pattern: As indicated on the Floor Finish Plans.

2.3 VINYL COMPOSITION FLOOR TILE **(VCT-1)**

A. Basis of Design Product: Subject to compliance with requirements, provide **Armstrong; "Standard Excelon Imperial Texture vinyl composition tile"** or Architect approved equal from one of the following:
1. Armstrong Flooring, Inc.
2. Tarkett
3. American Biltrite

B. Tile Standard: ASTM F1066, Class 2, through pattern.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch (3.2 mm).

E. Size: 12 by 12 inches (305 by 305 mm).

F. Colors and Patterns: As indicated on the Finish Legend.

G. Installation Method: Monolithic.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modular carpet tile.

B. Related Requirements:
1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.

6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

1.10 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty: Lifetime Commercial Limited.

PART 2 - PRODUCTS

2.1 CARPET TILE **(CPT-1)**

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Interface "Open Air 404"** or Architect approved equal product by one of the following:

1. Interface, LLC.
2. Patcraft; a division of Shaw Industries, Inc.
3. Shaw Contract Group; a Berkshire Hathaway company.

B. Color: Refer to finish legend for color and style.

C. Collection: Open Air Collection

D. Pattern: Non Directional

E. Fiber Type: 100% Recycled Content Nylon

F. Pile Characteristic: Tufted Pattern Loop

G. Total Weight: 23 oz./sq. yd. (780 g/sq. m) for finished carpet tile.

H. Primary Backing/Backcoating: Glasbac

I. Size: 19.69 by 19.69 inches (50 by 50 cm)

J. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

    a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

K. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than 3 lbf (13 N) according to ASTM D 1335.
5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).

8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
9. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

J. Trim Accessories

1. **Schluter-VINPRO-STEP (VPST 30 ATGB)** Brushed Nickel Anodized Aluminum. Location: Building C – Gillette Rd Office 117C and 117D

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099123 – INTERIOR PAINTING

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry
3. Steel.
4. Gypsum board.
5. Plaster.

B. Related Sections include the following:

1. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
2. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
3. Division 06 Sections for shop priming carpentry with primers specified in this Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

1. MPI Standards:

B. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

1. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

2.0 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.

2. ICI Paints.

3. Sherwin-Williams Company (The).

4. Or equal.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.

2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.

3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

4. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.

b. Acrylonitrile.

c. Antimony.

d. Benzene.

e. Butyl benzyl phthalate.

f. Cadmium.

g. Di (2-ethylhexyl) phthalate.

h. Di-n-butyl phthalate.

i. Di-n-octyl phthalate.

j. 1,2-dichlorobenzene.

k. Diethyl phthalate.

l. Dimethyl phthalate.

m. Ethylbenzene.

n. Formaldehyde.

o. Hexavalent chromium.

p. Isophorone.

q. Lead.

r. Mercury.

s. Methyl ethyl ketone.

t. Methyl isobutyl ketone.

u. Methylene chloride.

v. Naphthalene.

w. Toluene (methylbenzene).

x. 1,1,1-trichloroethane.

y. Vinyl chloride.

C. Colors: As indicated in a finish schedule.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E3.

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 3.

2.5 METAL PRIMERS

A. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E2.

B. Waterborne Galvanized-Metal Primer: MPI #134.

1. VOC Content: E Range of E2.

2. Environmental Performance Rating: EPR 2.

C. Rust-Inhibitive Primer (Water Based): MPI #107.

1. VOC Content: E Range of E2.

2. Environmental Performance Rating: EPR 2.

2.6 LATEX PAINTS

A. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 4.

B. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 4.5.

C. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 5.5.

3. VOC Content: E Range of E3.

2.7 EPOXY PAINT

A. Epoxy-Modified Latex, Interior, Gloss (Gloss Level 6): MPI #115.

2.8 DRY FOG/FALL COATINGS

A. Latex Dry Fog/Fall: MPI #118.

1. VOC Content: E Range of E2.

2. Environmental Performance Rating: EPR 2.

2.9 FLOOR COATINGS

A. Interior/Exterior alkyd floor enamel (Low Gloss): MPI #59 (maximum Gloss Level 3).

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 3.

3.0 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

2. Masonry (Clay and CMU): 12 percent.

3. Wood: 15 percent.

4. Gypsum Board: 12 percent.

5. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.

2. Sand surfaces that will be exposed to view, and dust off.

3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

J. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

    a. Uninsulated metal piping.

    b. Uninsulated plastic piping.

    c. Pipe hangers and supports.

    d. Tanks that do not have factory-applied final finishes.

    e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.

    f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

    g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

    a. Switchgear.

    b. Panelboards.

    c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

    d. Other miscellaneous items not listed above.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Masonry Substrates

1. Institutional Low-Odor/VOC Latex System: MPI INT 4.2E.

a. Prime Coat: Interior/exterior latex block filler.

1) Basis of Design:, Speedhide Int/Ext Block Filler No 6-15 by PPG Paints

2) Omit primer on walls that have been previously coated.

b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.

c. Topcoat: Acrylic Latex (Semi-Gloss).

1) Basis of Design: Speedhide Int/Acrylic Semi-gloss No 6-500 by PPG Paints

2) Location: All interior masonry.

B. Steel Substrates:

1. Water-Based Dry-Fall System: MPI INT 5.1C.

a. Prime Coat: Quick-drying alkyd metal primer.

b. Topcoat: Latex dry fog/fall.

1) Basis of Design: Speedhide Super Tech Waterbased Acrylic Flat Dry Fall No. 6-725xi BY PPG Paints

Location: New/Existing exposed steel structure and deck, stairs & railings

2. Latex System: MPI INT 5.1S.

a. Prime Coat: Rust-inhibitive primer (water based).

1) Basis or Design: Pitt Tech DTM Acrylic Primer-Finish No. 4020-1000 by PPG Paints

b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.

c. Topcoat: Institutional low-odor/VOC interior latex (Semi-Gloss)

1) Basis of Design: Pitt Tech Plus Int/Ext High Performance Acrylic by PPG Paints

2) Omit primer on existing coated surfaces

3) Location: Door Frames/Railings, Interior steel railing, stairs risers, stringers, and all associated steel.

C. Gypsum Drywall Substrate:

1. Institutional Low-Odor/VOC Latex System: MPI INT 10.1D.

a. Prime Coat: Interior latex primer/sealer.

1) Basis of Design: Speedhide Interior Acrylic Primer No-6-2 by PPG

b. Topcoat: Institutional low-odor/VOC interior latex matching topcoat.

1) Basis of Design: Speedhide Interior Acrylic-Semi-Gloss by PPG Paints.

2) Location: All locations not specified in another category

D. Gypsum Drywall Substrate:

1. Institutional Low-Odor/VOC Latex System: MPI INT 10.1D.
    a. Prime Coat: Interior latex primer/sealer.
        1) Basis of Design: Speedhide Interior Acrylic Primer No-6-2 by PPG
    b. Topcoat: Institutional low-odor/VOC interior latex matching topcoat.
        1) Basis of Design: Pitt Tech Plus Int/Ext High Performance Acrylic, Semi- Gloss by PPG Paints
        2) Location: GPDW locations in kitchens areas, Bathrooms, and Gym Areas
2. Institutional Low-Odor/VOC Latex System: MPI INT 10.1D.
    a. Prime Coat: Interior latex primer/sealer.
        1) Basis of Design: Speedhide Interior Acrylic Primer No-6-2 by PPG
    b. Topcoat: Institutional low-odor/VOC interior latex matching topcoat.
        1) Basis of Design: Speedhide Interior Acrylic-Flat Finish by PPG Paints.
        2) Location: Soffit and ceilings.

E. Plaster Substrates: Refer to Gypsum Drywall

END OF SECTION 099123

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of wood finishes on the following substrates:

1. Interior Substrates:

1. Dressed lumber (finish carpentry or woodwork).

B. Related Sections include the following:

1. Division 09 Section "Interior Painting" for surface preparation and application of standard paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.

1. Submit Samples on representative samples of actual wood substrates, 8 inches (200 mm) square.

2. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of MPI's current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in its "MPI Approved Products List."

2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and finish systems indicated.

B. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).

b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.

a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply exterior finishes in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

2.0 PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.

2. ICI Paints.

3. Sherwin-Williams Company (The)

2.2 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

B. Stain Colors: As selected by Architect from manufacturer's full range.

2.3 STAINS

A. Interior Wood Stain (Semitransparent): MPI #90.

1. VOC Content: E Range of E2.

2.4 WATERBORNE ACRYLIC FINISHES

A. Waterborne Clear Acrylic (Semigloss): MPI #129, Gloss Level 5.

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 3.

3. Location: Wood Trim.

B. Waterborne Clear Acrylic (Gloss): MPI #130, Gloss Level 6.

1. VOC Content: E Range of E3.

2. Environmental Performance Rating: EPR 3.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.

3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.

4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, reinstall items that were removed; use workers skilled in the trades involved. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.

2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

3. Countersink steel nails, if used, and fill with putty tinted to final color to eliminate rust leach stains.

3.3 SANDING AND FINISHING WOOD TRIM AND STAGE FLOOR

A. Schedule floor finishing to be completed just before final inspection, Project acceptance and Substantial completion.

B. Machine sand existing wood indicated to be refinished shall be machined sanded to remove existing finish and expose a clean wood surface.

1. Remove and ridges and cupping. Sand smooth to remove sanding machine marks that would be noticeable after finishing, ending with 00 grade sandpaper. Vacuum and tack clean and immediately apply finish.

2. Take care to minimize amount of wood removed from surface to avoid splintering and exposure of fasteners.

3. After sanding, buff entire area with 100 grit screenback or equivalent using heavy duty buffing machine. Thoroughly vacuum and tack clean the entire surface prior to applying any sealer or finish material. Prevent the spread of dirt, dust and debris to and from the working area during the entire process and follow the manufacturer's recommendations for providing adequate ventilation to the work area.

3.4 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.

2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.5 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when finishes are being applied:

1. Owner will engage the services of a qualified testing agency to sample finish materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces if, on refinishing with complying materials, the two finishes are incompatible.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.7 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Finish Carpentry Substrates:

1. Waterborne Clear Acrylic Over Stain System: MPI INT 6.3W.

a. Stain Coat: Interior wood stain (semitransparent).

b. Three Finish Coats: Waterborne clear acrylic (semigloss) (gloss).

END OF SECTION 099300

SECTION 099600 - HIGH-PERFORMANCE COATINGS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior Substrates:

a. Steel lintels and dunnage.

2. Interior Substrates:

a. Steel Stair railings, stringers, risers, and posts at **Building A- High School**

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of finish-coat product indicated.

C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.

2. Step coats on Samples to show each coat required for system.

3. Label each coat of each Sample.

4. Label each Sample for location and application area.

D. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

A. Master Painters Institute (MPI) Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than [1 gal. (3.8 L)] of each material and color applied.

2.0 PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. Provide products of same manufacturer for each coat in a coating system.

B. Colors: As selected by Architect from manufacturer's full range.

2.2 METAL PRIMERS

A. Two-Component, Penetrating epoxy primer sealer:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. PPG Protective and Marine Coatings, ppgpmc.com

1) **Amerlock Sealer 2mils DFT**.

2.3 URETHANE MASTIC

A. Two-component, DTM urethane mastic

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. PPG Protective and Marine Coatings, ppgpmc.com

1) **Durethane DTM 95-3300 Series**.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

3. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce coating systems indicated.

C. Steel Substrates: Remove all rust, dirt, moisture, grease and loose mill scale.

1. Blast clean according to SSPC-SP 6/NACE No. 3, " Commercial Blast Cleaning. All surfaces clean and dry.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.

2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:

1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.

2. Testing agency will perform tests for compliance with specified requirements.

3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove non-complying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. Two-component Urethane Mastic, Over Epoxy Primer Se:

a. Prime Coat: **Amerlock Sealer 2mils DFT** @ 2 mils DFT.

b. Topcoat: **Durethane DTM 95-3300 Series** @ 2.0 mils DFT.

2. Finish: As selected by Architect from manufacturer's full range of sanded colors.

END OF SECTION 099600

SECTION 101423 – PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Field-applied, vinyl-character signs.
   2. Exterior Panel signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details for signs.

   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
   3. Show message list, typestyles, graphic elements**,** including raised characters and Braille, and layout for each sign at least half size.
   4. Signage schedule in manufacturer's format for verification of text/copy.
   5. Show materials, construction detail, lay-out, copy, size, and mounting methods.
   6. Engineering drawings for each sign type.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

   1. Panel Signs: Full-size Sample.

2. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on base material.
3. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
4. Exposed Accessories: Full-size Sample of each accessory type.
5. Full-size Samples, if approved, will be returned to Contractor for use in Project.

D. Sign Schedule: Indicate all rooms to receive signage. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Manufacturer.

B. Sample Warranty: For special warranty specified in this Section.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Surface Burning Characteristics:
1. All interior signs shall be fabricated of materials tested and certified to meet the following burning properties:
    a. Flame Spread: ASTM E84 Class A, not more than 25;
    b. Smoke Density: ASTM D2843 not over 75; or ASTME84 not over 450.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Product: Subject to compliance with requirements, provide Takeform, 1.800.528.1398, www.takeform.net or Architect approved equal.

2.2 SIGN STANDARDS

A. It is the intent of these specifications to establish a sign standard for the Owner including but not limited to primary and secondary directories, wall mounted and overhead directional, flag mounted directional, primary room identification, restrooms, and all code compliant signage. While the Owner may not obtain all signs and sign types, the signage contractor shall design and submit approval drawings for all.

B. Engineered and Tested:
1. The signage system shall have undergone rigorous testing to ensure longevity and optimal performance. Testing shall include environmental testing to ensure materials can withstand changes in temperature and humidity without distortion as well as testing to ensure resistance to chemicals and UV effects. Further, mechanical testing shall ensure that the tensile and pull-out strength of mounting hardware is adequate to ensure a safe installation. Test data shall be included with submittals.

C. Typography:
1. Type style: See signage types. Copy shall be a true, clean, accurate reproduction of typeface(s) specified. Upper and lower case or all caps shall be as indicated in Sign Type drawings and Signage Schedule. Letter spacing to be normal and interline spacing shall be set by manufacturer.
2. Arrows, symbols, and logo art: To be provided in style, sizes, colors and spacing as shown in drawings.
3. Grade II Braille utilizing perfectly round, clear insertion beads.

D. Color and Finishes:
1. Colors, patterns and artwork: see signage types.

2. Message Background: signage types.
3. Finishes are to meet current federal ADA and all state and local requirements.

2.3 SIGNAGE

A. Signage System:
1. The signage shall be a direct print acrylic sign system with applied graphics.
2. Signage shall be capable of accepting direct prints including colors, patterns, graphic images, and photography. Prints shall be second surface to protect from scratches, fading, or other damage.
3. All signs, including room ID's, overheads and flag mounts, directional and directories shall have a matching appearance and constructed utilizing the same manufacturing process to ensure a consistent look throughout.
4. The entire sign shall be 65% post industrial waste and 100% recyclable under Code 7.

B. Materials:
1. Panel signage shall be fabricated of acrylic, .375" thick, comprised of two layers. Edges shall be smooth without chips, burrs, sharp edges or marks. The direct print shall be second surface to prevent scratching, fading, or other damage.
2. Acrylic shall be non-glare optically clear with a P99 finish assuring no loss of clarity or composition of the print, and shall meet the following properties:
   a. ASTM D 4802, Category A-1, Type UVA.
3. The signage shall utilize a pressure activated adhesive. The adhesive shall be nonhazardous and shall allow for flexing and deflection of the adhered components due to changes in temperature and humidity without bond failure.
4. Signage shall have an acrylic shim plate. The shim shall lift the sign off the wall to facilitate cleaning and painting without sign removal.
5. All signs shall be provided with appropriate mounting hardware. All hardware shall have a polished anodized finish, architectural in appearance and suitable for the mounting surface.

C. Colors, Patterns, Imagery and Artwork:
1. Vendor shall provide an online library of images including patterns, graphics and photography. The library shall be organized by idea or theme to facilitate the selection of images appropriate for the project.
2. All images shall have a minimum resolution of 300 dpi.
3. Face and background colors shall be per the drawings.
4. Standard tactile colors shall match manufacturers ADA standard color selection. Font and font colors shall be per the drawings.

2.4 SIGNAGE TYPES

A. **Type A:** Field Applied Vinyl Graphic
1. Each Signage number corresponds to interior room number.
2. Color: White
3. Font: **Futura Bold**
4. Size: 6 inches
5. Location: As indicated on drawings – Coordinate location on window with owner

B. **Type B:** Exterior Panel Signs
   1. Each Signage number corresponds to exit number provided by owner.
   2. Border Background: White
   3. Text: Red
   4. Font: **Futura Bold**
   5. Font Size: 8 inches
   6. Panel Size: 12 inches x 12inches
   7. Panel Material: Acrylic
   8. Location: As indicated on the drawings – Coordinate with owner

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer shall examine signs for defects, damage and compliance with specifications. Installation shall not proceed until unsatisfactory conditions are corrected.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

D. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

E. Verify that electrical service is correctly sized and located to accommodate signs.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions. Installation locations shall be in accordance with ADA specifications. Locate signs where indicated using mounting methods in compliance with manufacturer’s written instructions:

   1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Install signs so they do not protrude or obstruct according to the accessibility standard.
   3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
   4. The signage contractor shall coordinate installation schedules with the Owner and/or Construction Manager.
   5. The signage contractor shall submit a CAD generated location plan noting the location of all signage and cross referenced to message schedule or plots for architect’s approval.

6. Installer to conduct pre-installation survey prior to manufacturing to verify copy and sign location. Each location shall be noted using a low tack vinyl reproduction of actual sign. Any location discrepancy or message issues shall be submitted to architect for review.
7. Upon completion of the work, signage contractor shall remove unused or discarded materials, containers and debris from site.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 112216.29 - PACKAGE TRANSFER/RECEIVER UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel fire-resistant, bullet-resistant package transfer/receiver units.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles and finishes for each package transfer/receiver unit.

2. Installation procedures for the bullet resistant door and frame assemblies required.

B. Shop Drawings: For package transfer/receiver units.

1. Include plans, elevations, sections, and attachment details. Detail fabrication and installation, including field joints.

2. Show locations and sizes of cutouts and holes for items installed in other surfaces.

C. Samples: For each exposed product and for each color and texture specified, **6 inches (150 mm) square in size.**

1. Include ballistic-resistant materials.

2. Include fire-retardant-treated materials.

D. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of package transfer/receiver unit.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For package transfer/receiver unit to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Package transfer/receiver unit manufacturer or a qualified installer **who is approved by manufacturer**.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install units until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where units are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Established Dimensions: Where units are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of package transfer/receiver unit that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Five** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Package Transfer/Receiver Units.: Package Transfer/Receiver, accessories and hardware shall be provided such that the entire assembly be **UL Listed Units and shall bear a Dual UL Label for Ballistics.**

B. Fire-Rated Package Transfer/Receiver Units.: Units complying with NFPA 80 that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 80 - Standard for Fire Doors and Other. Opening Protectives, or UL 10B - Standard for Safety - Fire Tests of Door Assemblies.

C. Fire-Rated Package Transfer/Receiver Units: Listed and labeled to comply with requirements in ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials -for fire-resistance rating of walls where they are installed.

D. **Fire-Rating: 1-hour, minimum.**

E. Ballistic-Resistant Package Transfer/Receiver Units: – All bullet resistant doors will be manufactured from bullet resistant steel in accordance with UL 752 - Standard of Safety UL 752 Bullet Resisting Equipment and the Fire Classification.

F. **Ballistic-Rating: Level 3, minimum.**

2.2 FIRE-RESISTANT, BULLET-RESISTANT PACKAGE TRANSFER/RECEIVER UNITS <**PR-1**>:

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide product manufactured by **Armortex**, 5926 Corridor Parkway, Schertz, Tx 78154, website: info@armortex.com, tel: 1-800-880-8306 or 1-210-661-8306, **Model #: TE-PA-LK-18**, or comparable product by one of the following:

1. Covenant Security Equipment.
2. Creative Industries.
3. CRLaurence.
4. Eagle Peak Products.
5. Fasco Security Products.
6. Total Security Solutions.

B. Construction:

1. Door Panels:

a. The door panels shall be manufactured straight, true and square.

b. Doors shall be fabricated of 14-gauge stainless steel.

2. Hardware:

a. Outer and inner shall feature an interlocking mechanism that prevents the doors from being open simultaneously, permitting only one door to be in the open

position, allowing packages to be passed through a barrier without a security breach.

b. Door closer on exterior and interior doors.

c. Continuous Hinges.

d. Each door shall be equipped with a door pull per as per the manufacturer's standard design.

3. Housing Assembly:

a. Fixed four-sided exterior trim frame and a clamping type, three-sided interior trim frame.

1) Fully welded frame.

4. Material: #4 brushed stainless steel with stainless steel doors and trim.

5. Size: As indicated on Drawings.

a. Note: Depth varies by Building/Wall Condition. Coordinate with Drawings.

6. Complete fabrication to maximum extent possible before shipment to Project site. **No** field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the architect.

7. Standard manufacturing tolerances shall be +/- 1/16"

8. Fire-Resistance and Bullet-Resistance: Refer to 2.1 Performance Requirements.

2.3 MATERIALS

A. Steel Sheet: Cold-rolled steel sheet, ASTM A1008/A1008M; or hot-rolled steel sheet, ASTM A1011/A1011M.

B. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 302 or Type 304.

C. Fire-Resistant Material: ASTM E119, or ASTM E84.

D. Ballistic-Resistant Material: ASTM F1233 and UL 752.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for Package Transfer/Receiver installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Package Transfer/Receiver Units' manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective material, where possible, to eliminate functional and visual defects. Where not possible to repair, replace material. Adjust joinery for uniform appearance.

B. Clean exposed and semi exposed surfaces.

C. Check and re-adjust operating finish hardware items, leaving product and proper operating condition.

D. Protection: Provide Kraft paper or other suitable covering over unit surfaces. Remove protection at Substantial Completion

END OF SECTION 112216.29

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Motor-operated roller shades with **single** rollers.

B. Related Requirements:

   1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

   1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark interior face of material if applicable.
   2. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

F. Product Schedule: For roller shades.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Draper Inc.
   2. Hunter Douglas Contract

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.

      a. Electrical Characteristics: 120-VAC
      b. Maximum Total Shade Width: As required to operate roller shades indicated and as required by window type.
      c. Maximum Shade Drop: As required to operate roller shades indicated and required by window type.
      d. Maximum Weight Capacity: As required to operate roller shades indicated

   3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for flush mounting. Provide the following for remote-control activation of shades:

      a. Individual Switch Control Station: Maintained contact, wall-switch-operated control station with open, close, and center off functions.

         1) Switch Positions: Three
         2) Switch Style: Toggle.

      b. Group Control Station: Maintained contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for single-switch group control.
      c. Color: As selected by Architect from manufacturer's full range

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands

indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller
3. Shadeband-to-Roller Attachment: Manufacturer's standard method
4. Coupler Assembly Location: Centered between each set of shade panels two shade panels

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly. Provide (1) coupler assembly per window bay for a total of (3) coupler assemblies.

F. Location: Location of motorized roller shades are the following, refer to drawings:
1. **Building F – Allen Road: All windows in room 107 Cafetorium**

G. Shadebands:

1. Shadeband Material: Light-filtering fabric
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material
b. Color and Finish: As selected by Architect from manufacturer's full range

H. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than **3 inches (76 mm)**

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

a. Height: Manufacturer's standard in height required to enclose roller and shadeband assembly when shade is fully open, but not less than **3 inches (76 mm)**

3. Endcap Covers: To cover exposed endcaps.
4. Installation Accessories Color and Finish: As selected from manufacturer's full range

I. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701 Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

J. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer

2. Weave: Basketweave
3. Thickness: Manufacturers standard
4. Roll Width: Coordinate roll width with window or curtain wall
5. Orientation on Shadeband: Railroaded
6. Openness Factor: 1 percent.
7. Color: As selected by Architect from manufacturer's full range

2.3 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than **1:4** provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than **2 inches (51 mm)** to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Coupler Assembly: Install one coupler assembly per window bay, centered between two shade panels. Refer to manufacturer’s standards for assembly.

D. ADJUSTING

E. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.3 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123216 – MANUFACTURED PLASTIC LAMINATE CASEWORK

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes:

1. Decorative laminate casework and accessories as shown and listed on drawings and specified herein. Include all countertops, splashes, supports, shelving, and filler panels necessary for a complete casework installation. Work includes standard items, modified standard items, and custom items, as detailed on the drawings and indicated as work of this section.

B. Related work specified elsewhere:

1. Section 061000 “Rough Carpentry” for backing material, blocking, and cleats associated and required for casework construction.

2. Section 092216 “Non-Structural Metal Framing” for back plates required for installing casework and concealed within other construction before casework installation.

3. Section 09 for all flooring types being installed where casework is present.

4. Section 096513 “Resilient Base and Accessories” for resilient base applied to manufactured casework.

5. Section 123623- “Plastic Laminate Countertops” for countertops to coordinate with plastic laminate base cabinets.

6. Section 123661- “Solid Surface” for solid surface countertops to coordinate with plastic laminate base cabinets.

7. Division 23 HVAC (registers and Diffusers)

8. Division 26 Electrical (fixtures, service lines, conduit wiring).

1.3 DEFINITIONS

A. Exposed Portions of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches (1200 mm) above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets after installation shall not be considered exposed.

B. Semi-exposed Portions of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches (1980 mm) or more above floor are defined as semi-exposed.

C. Concealed portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.4 STANDARD OF QUALITY

A. Manufacturer and Installer upon request must provide the following proof of ability to perform under this contract.

1. Casework Manufacturer must be duly certified for premium grade from the AWI Quality certification Program for sections 400 (Architectural Cabinets) and 1600 (Modular Cabinets).

2. Casework of nationally recognized casework manufacturers who have been providing and installing products in the project's vicinity for at least five (5) years may be considered for approval providing it is equal in construction and design according to drawings and specified herein.

3. Minimum of five completed installations of equal size and requirements that can be inspected prior to the award of the contract.

4. Financial and technical resources of sufficient scope to assure prompt and satisfactory performance in the production, delivery and installation of all work specified under this section so as not to delay the progress of the work.

5. Failure to meet any of these requirements and qualifications may be sufficient cause for the rejection of proposed supplier.

B. The specifications and drawings define and show the essential minimum requirements as to the quality of materials, hardware, finish, construction design, function, and overall workmanship of the equipment. All equipment and casework must strictly comply with these specifications.

C. Where a definite material or manufacturer is specified, it is not the intent to discriminate against any product of another manufacturer. However, it is the intent of this specification to provide for the Owner a quality and functional installation of equipment and casework, and to exclude inadequate or inferior casework.

D. The use of catalog numbers and specific requirements set forth in drawings and specifications are not intended to preclude the use of acceptable casework manufacturer's product. Named manufacturers are used for the purpose of establishing quality of material, construction, and workmanship.

E. Manufacturers seeking approval to bid shall submit evidence of adequate plant; equipment and manpower to produce the quality of casework specified and deliver on schedule.

F. Equipment, fixtures and work by casework provider responsible for this section's work shall include:

1. Furnish, deliver, uncrate, set in place, level and anchor all casework and equipment listed in the specifications and/or as shown on the drawings.

G. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 548.

H. Single-Source Responsibility: Obtain plastic laminate casework from one source of a single manufacturer.

1.5 WARRANTY

A. All casework materials shall be guaranteed for three years from the date of installation. Defects reported within the guarantee period will be corrected without charge.

B. The casework manufacturer shall warranty against structural failure of the cabinet body under normal use for a period of ten years from date of installation.

C. Warranty shall be in the form of a letter addressed to owner and Architect, signed by an officer of the company responsible for fabrication of the casework.

1.6 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each casework type specified.

C. Product data for each hardware unit specified.

D. Product data for each core material serving as a substrate for plastic laminate.

E. Shop drawings for casework showing location and size, construction details, accessories, materials, finish, and filler panels. Include fully dimensioned plans, elevations, and installation and anchorage details to floors and walls and for countertops.

F. Shop drawings for countertops showing sizes; shapes; edge and backsplash profiles; cutouts for plumbing fixtures, heating grilles, electrical devices; etc.; methods of joining; installation details.

G. Samples for initial selection purposes:

1. Exterior of casework- samples of colors/ pattern that are indicated on the finish schedule/ legend, or equal.

2. Interior of casework- samples to match the color of the plastic laminate on the exterior of casework.

3. Countertops- samples of color/pattern as indicated on the finish schedule/ legend, or equal.

4. PVC Edge banding- in color that is indicated on the finish legend or equal.

H. Samples for verification purposes in full-size units of each type of material indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

1. The architect reserves the right to thoroughly review the full cabinet samples to the point of dismantling the cabinets if deemed necessary to verify materials and construction details.

I. Sample(s) of core materials: Wheat or Strawboard, Particle Board, Plywood as applies.

1. Minimum 4-inch x 3-inch (100 x 75mm).

2. Samples must be clearly marked and correspond with product data as specified in article 1.6.D above.

J. One unit of each type of exposed hardware.

K. One unit for each of manufacturers specified grilles for countertop and ventilated toe board/sub-base.

L. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

M. Product Test Reports: Based on tests performed by a qualified independent testing agency, indicate compliance of casework finishes and countertops with requirements specified for chemical and physical resistance.

1.7 DELIVERY, HANDLING, STORAGE

A. All casework specified herein shall be delivered to the job site as required, received and handled by the contractor or his authorized agent.

B. All casework shall be delivered in one piece where possible. When it is impractical to do so, such casework may be delivered in sections and assembled in position. An authorized factory mechanic shall supervise assembly.

C. Deliver casework only after building is secure, dry, permanent ventilation systems are operational and meet the following environmental criteria.

D. Store materials in a ventilated place, protected from the weather with relative humidity maintained between 30% and 55% and temperatures between 60- and 70-degrees F. For additional installation condition, refer to Part 3 – EXECUTION, article “Casework Installation”.

E. All casework shall be delivered in such a manner as to protect it against dirt, water, chemical and mechanical injury.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Comply with casework manufacturer's written requirements for temperature and humidity conditions during storage and installation. Do not install casework until these conditions have been attained and stabilized.

B. Field Measurements: Verify casework dimensions by field measurements.

1. Verify countertop size and shape prior to fabrication by field measurements taken after base units are installed.

2.0 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plastic Laminate Casework:

a. Case Systems, Inc., 2700 James Savage Road, Midland Michigan 48642 (989) 496-9510.

b. L.S.I. Corporation of America, Inc. 2100 Xenium Lane Minneapolis, MN 55441 (763) 55-9-4664.

c. TMI Design, 50 South Third Avenue West Avenue West, Dickinson, ND 58601-5595 (800) 456-6716

2. Plastic Laminate

a. Wilson Plastics Co., Wilsonart.

b. Formica Corp.

c. Nevamar Corp.

B. The owner, or its designated representative, reserves the right to reject any proposal that in his/her opinion fails to meet the criteria established by the specification. Such a decision shall be final.

C. General: Provide decorative laminate casework as specified and featuring the following:

1. Full overlay Door and Drawer Fronts

2. Five Knuckle Institutional Grade Hinges

3. 3MM PVC Door and Drawer Edges

4. Non-Racking, Non-Deflecting Platform Drawer Box With 1/2” Thick Bottoms

5. 1/2” Thick Inset and Captured Cabinet Backs

6. Thermalfused Laminate Interior Which Exceeds NEMA LD3-2005 for VGS Performance

7. Separate and Full Support Base Construction.

D. Refer to interior elevations for style or configuration of casework.

2.2 MATERIALS

A. Exterior Vertical Surfaces:

1. All door and drawer fronts, finished end panels, and exposed exterior backs shall be surfaced with .028" thick high-pressure decorative laminate conforming to NEMA LD3-2005, VGS.

a. Refer to drawings for colors selected by Architect.

2. All exterior vertical high-pressure laminate panels shall be balanced with textured .020" thick high-pressure cabinet liner conforming to NEMA Standard LD3-2005, CLS. Color shall match interior and exterior color.

3. All high-pressure laminate must be laminated using a PVA adhesive, set under pressure, resulting in a rigid glue line. **Contact adhesives shall not be used.**

B. Interior Exposed Surfaces:

1. Interior surfaces, including cabinets without doors, cabinets with glazed doors, open shelving, and underside of wall cabinet bottoms, shall be laminated with color to match exterior thermal-fused laminate.

C. Thermally Fused Interiors at Semi-Exposed Surfaces:

1. Interior surfaces behind doors, drawer boxes, backs and unfinished ends shall be laminated with a thermally fused laminate, in standard manufacture color. Architect to select from full range.

D. Edges:

1. All door, drawer, and exposed edging shall be 3mm PVC. The PVC shall be applied utilizing hot melt adhesive and radiused by automatic trimmers. Hand tool applying and trimming of PVC shall not be allowed. Edging shall be selected from full range.

E. Particleboard: All particleboard shall be Grade M-3 Industrial, according to the American National Standard (ANSI) for Mat-Formed Wood Particleboard, ANSI/NPA A208.1-2009 and shall meet or exceed the following:

1.	Density:	47 lbs/cu. ft.
2.	Moisture Content:	6%
3.	Modulus of Rupture:	2400 psi
4.	Modulus of Elasticity:	398,900 psi
5.	Internal Bond:	80 psi
6.	Hardness:	500 pounds
7.	Linear Expansion:	0.35%

8. Thickness Tolerance: +/- 0.008" panel average.

   +/- 0.004" within panel

9. Face Screw Holding: 247 pounds.

10. Edge Screw Holding: 225 pounds.

11. Formaldehyde Content: Provide only particleboard with no added urea formaldehyde content in adhesives or binder.

F. Particleboard, water-resistant: ANSI A208.1 Grade M3 made with binder containing no urea formaldehyde.

1. Equivalent to Sierra Pine MR MC elite grade.

2. Maximum thickness swell $\leq$ 5.5%.

2.3 HARDWARE

A. Pulls:

1. One pull shall be located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximize drawer slide life. Provide 5/16" diameter clear anodized, solid aluminum, wire pulls at all locations.

2. One pull shall be located at each casework door. Provide 5/16" diameter clear anodized, solid aluminum, wire pulls at all locations.

B. Hinges: (See "Performance" article below for test criteria)

1. Hinges shall be .095" steel five-knuckle hospital-tip institutional grade quality with .187" diameter tight pin. Residential, kitchen type pivot, plain butt, or hinges with removable pins "shall not be acceptable". Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges. Finish shall match satin chrome.

C. Drawer Slides: (See "Performance" article below for test criteria)

1. Standard Drawer: Self-closing, bottom mount epoxy coated with captive roller and positive in stop and out-position keeper. Slide shall have 150# rating, full extension type, must be self closing within last 3" of travel, and must prevent drawer fronts from contacting the cabinet body. Knapp & Vogt #1485. Screw to bottom rail of drawer.

2. Keyboard Slide: Accuride Model 2009, variable height, 3/4 extension,

   a. 75 lb. capacity, black zinc.

D. Door Catches:

1. Base Cabinets: 7-pound magnetic catch.

E. Adjustable Shelf Supports:

1. Two pin nylon/plastic clips with hold down tabs. Rated for 250-300 pounds of force per clip.

F. Wardrobe Hanger Rod:

1. 1-1/16" diameter, 0.087" wall thickness; stainless steel finish, K & V #660 SS; with end sockets, K & V #732 & #735 CHR.

G. Locks:

1. CompX (formerly National Lock) five-disc tumbler cam locks in chrome finish.

2. Lock core is removable with a control key, permitting Owner to easily change lock arrangements without tools.

3. Inactive door of base and wall cabinets shall be secured by using an elbow catch or a chain bolt for tall cabinets.

4. Keying: Locks shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non-interchangeable master key groups.

5. Keys: Stamped brass available from manufacturer or local locksmith and supplied in the following quantities unless otherwise specified.

6. 2-for each group keyed alike locks.

7. 6-for master keys for each system.

a. Required Lock locations:

1) All location, all keyed alike.

H. Ventilation Grilles: Where indicated on drawings or otherwise required, provide ventilating grilles for installation in sub-base toe board and countertops at all locations where wall mounted fin tube radiation is situated behind cabinets. Grilles shall be equivalent to the following:

1. Toe base: perforated aluminum with baked enamel finish, color to match cabinet base

2. Countertop: Extruded aluminum bars and frame; pencil proof style bar grille, 4” width, extruded frame.

a. Basis of Design Product: Subject to compliance with requirements, provide **Architectural Grille; “AG20 Bar Grille with A-Frame mount”** or Architect approved equal product.

I. Filler Panels/Strips:

1. Provide where required for closing space between cabinets, walls, ceilings and on top of upper/tall storage cabinets where no soffit or ceiling is provided.

2.4 CONSTRUCTION

A. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners as approved by the Architectural Woodwork Standards 1st Edition-2009 Section 10 subsection 4.4.20.4. They shall be especially designed for use in joining particleboard panels.

B. All joints are tight fitting and will not rupture or loosen due to the following:

1. Dimensional changes in the particleboard.

2. Racking of casework during shipment and installation.

3. Normal use.

4. Seismic shock as tested and approved by the Woodwork Institute of California for casework used in schools and hospitals.

C. All fastening devices and screws shall be treated to deter or resist corrosion.

D. Construction Features -- All Cabinets:

1. All structural components shall be 3/4" thick particleboard with balanced surfaces.

2. All back panels shall be 1/2" thick particleboard surfaced both sides for balanced construction.

3. All drawer components shall be 1/2" thick particleboard with balanced surfaces.

4. Mounting stretchers are 3/4" thick structural components fastened to end panels by mechanical fasteners and are concealed by the cabinet back.

5. When cabinet backs are exposed a finished 13/16" thick decorative laminate back panel shall be substituted for stretchers.

6. Individually attached **exterior grade plywood** 4″ high bases for base cabinets and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. Also, to conceal the top edge of applied vinyl base molding. There shall be a front to back center support for all bases over 30" wide.

7. Provide cutouts in bases where indicated on drawings for installation of ventilation grilles by this division in toe board space. Provide cut outs or holes in intermediates and back to allow airflow under cabinets.

8. Horizontal parting rails between drawers shall be 3/4" particleboard with balanced surfaces, secured to and further reinforcing cabinet ends. When drawer stacks are keyed individually the parting rail shall run full depth of cabinet to prevent pilfer.

9. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row-hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.

10. All door and drawer fronts and finished ends shall be balanced construction with "high-pressure" laminate bonded to both sides of a 3/4" particleboard core with an overall finished dimension of 13/16" except as noted below.

11. Adjustable shelves shall be plywood core, balanced surfaces and have a .020" thick PVC front edge matching the shelf.

    a. Adjustable shelves over 30" wide shall be 1" thick.

    b. All other shelves shall be 3/4" thick.

12. Fixed Interior Components such as fixed shelves, dividers, and cubicle compartments shall be full 3/4" thick particleboard attached with concealed interlocking mechanical fasteners.

13. All doors shall be a maximum of 24" wide.

E. Base Cabinets:

1. Each end panel to be secured with a minimum of seven interlocking mechanical fasteners for a total tensile strength of 2,450 pounds.

2. All base cabinets, except sink cabinets, shall have a solid 3/4" thick sub-top fastened to the ends with interlocking mechanical fasteners.

3. All sink cabinets shall have a vertically mounted front stretcher panel supporting the countertop, a split removable back panel, and four steel corner gussets used to secure the countertop.

4. An upper 3/4" thick stretcher shall be located behind the back panel and attached to the end panels with interlocking mechanical fasteners. This stretcher is also fastened to the full sub-stop thus capturing the back panel.

F. Tall Cabinets:

1. Each end panel to be secured with a minimum of eleven interlocking mechanical fasteners for a total tensile strength of 3,850 pounds.

2. An intermediate fixed shelf shall be provided on all general storage cabinets to maintain internal dimensional stability under heavy loading conditions.

3. A 3/4" top and intermediate stretcher shall be located behind the back panels and attached to the end panels with interlocking mechanical fasteners.

4. The intermediate stretcher is secured to the intermediate shelf, thus capturing the back panel, with #8 x 2" plated flat head screws.

G. Drawers:

1. Drawer box shall be constructed with a full 1/2" thick non-racking, non-deflecting platform bottom which is carried directly by "L" shaped, bottom mount drawer glides. Sides are secured with 1 1/2" long screws directly into platform and into the sides.

2. Sides, back, sub-front and bottom shall be 1/2” thick 47# density particleboard surfaced both faces with Themalfused Laminate per 2.2.B.1. The top edge shall be .020" PVC matching the drawer color.

3. Corners shall be joined with fluted wood dowels and glue, minimum 32mm o/c.

4. Drawer fronts shall be removable and attached to drawer box sub-front with screws from inside of drawer.

2.5 PERFORMANCE

A. Laminates:

1. "High Pressure Laminates" shall meet the definition and performance requirements of NEMA LD3-2005. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Horizontal grade laminate for countertops shall be GP-50 or PF-42 as specified, backed for balanced construction with .020” liner.

2. Thermalfused Laminate shall meet the performance requirements of NEMA LD3-2005 for GP-28. Panel manufacturer shall provide published specification.

3. Materials shall be tested and certified to meet the following burning properties:

a. Flame Spread (ASTM E84): Class C, not more than 200.

b. Smoke Density: (ASTM D2843) not over 75; or (ASTM E84) not over 450.

c. Self-Ignition Temperature: (ASTM D1929) not less than 600°F.

4. Adhesives shall be UL listed as a part of the laminate application.

B. Five Knuckle Institutional Hinge:

1. ANSI 156.9.4.1,2,3,4: Two hinges mounted 23” on center on a 23-7/16” wide x 19-11/16" high cabinet door shall be capable of supporting a 100-pound test load located 1" from the outside edge of the door.

a. Cycle, open and close, from 5 degrees open through 95 degrees open

with no failure to hinges, door, or cabinet end panel.

b. The maximum horizontal permanent hinge set shall not exceed .030".

C. Drawers:

1. ANSI A156.4.11: A production drawer box 21-5/16" wide x 20 3/4" deep x 3-7/8" high with an applied finished front 6-7/16" high x 23 1/8" wide with a 20" drawer slides shall be tested as follows:

a. When uniformly loaded with 150 pounds and tested through 100,000 opening and closing cycles, the drawer shall operate freely.

b. When the drawer is fully extended, a 150-pound load shall be supplied to the drawer front at a point on the centerline of the drawer for one minute. No permanent damage or distortion shall occur.

D. Adjustable Cabinet Shelving:

1. When supported only at the ends, shelving shall not deflect in excess of 1/4" when loaded as follows:

a. Standard Shelving – 40-pounds/sq. ft.

b. Library, School, Hospital or other book shelving – 50 pounds/sq. ft.

3.0 PART 3 – EXECUTION

3.1 SHIPPING

A. All casework shall be blanket wrapped and delivered to the jobsite in furniture vans.

3.2 CASEWORK INSTALLATION

A. Casework shall **not** be delivered or stored at the jobsite until building has become adequately dry and secure.

B. Installation shall be by Casework Manufacturer's authorized representative.

C. Casework is to be installed plumb and true, and is to be securely anchored in place. Scribe casework fillers as necessary for a tight fit.

D. Wall cabinets shall be securely fastened to minimum 16-gauge steel back plate anchors between studs not to plaster, lath or wallboard. Installation of back plate anchors shall be provided by appropriate trade during erection of walls. Casework manufacturer shall accurately locate anchoring requirements on shop drawings.

1. Install countertops on base cabinets using screws.

3.3 MAINTENANCE INSTRUCTIONS

A. The casework Contractor shall include in his bid price the cost of providing a technically qualified representative for a period of one day (minimum) to thoroughly instruct the

Owner's personnel in correct procedures of operating and maintaining all equipment and/or material installed under this section.

B. This instruction period shall be set at the Owner's option, but shall be within 30 days after the completed installation is accepted.

C. Keys shall be appropriately labeled and turned over to the Owner.

3.4 CLEANING AND PROTECTION BY CASEWORK CONTRACTOR

A. Empty drawers of dirt and dust. Wipe out cabinets interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets and countertops. Remove all packaging, scraps, and debris resulting from casework installation activities.

B. Make final adjustments to doors and drawers. Doors shall swing freely, catches shall hold securely, and all other doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding and without excessive slide play.

C. Keys shall be appropriately labeled and turned over to the Owner.

END OF SECTION 123216

SECTION 123623- PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes

1. Plastic-laminate-clad countertops.

2. Wall mounted, heavy duty, welded brackets for supporting countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For plastic-laminate-clad countertops.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.
3. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

D. Samples for Initial Selection: For plastic laminates.

E. Samples for Verification: As follows:

1. Plastic Laminates: For each type, color, pattern, and surface finish required, 8 by 10 inches (200 by 250 mm) in size.

2. Wood-Grain Plastic Laminates: For each type, color, pattern, and surface finish required, 12 by 24 inches (300 by 600 mm) in size.

3. Fabrication Sample: For each type and profile of countertop required, provide one sample applied to core material with specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer/fabricator.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Adhesives.

C. Quality Standard Compliance Certificates: AWI Quality Certification Program.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: S hop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Shop Certification: AWI's Quality Certification Program accredited participant.

B. Installer Qualifications: AWI's Quality Certification Program accredited participant

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.

B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Grade: Premium

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match Architect's sample.

E. Edge Treatment: 3.0-mm PVC edging

1. All edges that will be exposed to receive 3mm edge banding.

F. Core Material: Laminate bonded to solid core particleboard. Backsplashes shall be 3/4" thick particleboard with HGS Laminate finish provided loose for field installation (except at post-form laminate tops. Core shall be balanced with HPL backer.

G. Core Material at Sinks: Moisture resistant particleboard for entire counter with a sink.

H. Core Thickness: 2 layers 3/4 inch (19 mm) with ¾” splashes

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

J. Provide cutouts where indicated for installation of architectural bar grilles supplied by HVAC.

2.2 WOOD MATERIALS

A. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.

1. Particleboard: ANSI A208.1, Grade M-2 and Grade M-2-Exterior Glue at wet areas.

2.3 ACCESSORIES

A. Cable Grommets:

1. Equal to Doug Mockett and Company, Inc., #TG or equal, 2-3/8” O.D. molded plastic grommets with 2-inch hole and plastic cap with slot for wire passage.

2. Color to be selected from manufacturers standard color selections.

3. Provide where indicated on drawings, coordinate locations with owner.

B. Workstation Brackets:

1. A & M Hardware, Inc. 1/8” steel, 1 ½” forms with multiple ¼” mounting holes.

2. Size: As required by manufacturer to support weight of worksurface as detailed/ fabricated. (Worksurface fabricator to verify sizing with bracket manufacturer before installation.)

3. Color: Black

2.4 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate Adhesive that conforms to ANSI A161.2-1998 Performance Standards for Fabricated High-pressure Decorative Laminate Countertops

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times countertop fabrication will be complete.

2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of cutouts by saturating with varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches (3-mm-in-2400-mm) variation from a straight, level plane.

2. Secure backsplashes to walls with adhesive.

3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semi-exposed surfaces.

C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material window stools.

1.2 ACTION SUBMITTALS

A. Product Data: For solid surface materials.

B. Shop Drawings: For window stools. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for ventilation grilles.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

1. Solid surface material, 6 inches (150 mm) square.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

1. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

    1. Minimum of three years documented experience in fabricating solid surfacing countertops similar in scope and complexity to this Project. Currently certified by the manufacturer as an acceptable fabricator.

A. Installer Qualifications: Fabricator of countertops and window stools.

1. Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as indicated on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of stools by field measurements after windows are installed but before window stool fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities and ventilation grilles that will penetrate window stools or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE MATERIALS **(SS-1)**

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.

1. Basis of Design: Subject to compliance with requirements, provide Wilsonart; Solid Surface, or Architect approved equal.

a. Type: Provide Standard type unless Special Purpose type is indicated.

b. Colors and Patterns: As indicated on the Finish Legend.

B. Particleboard: ANSI A208.1, Grade M-2.

C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 FABRICATION

A. Fabricate window stoos according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

2. Front: Straight, slightly eased at top.

3. Backsplash: Straight, slightly eased at corner.
4. End Splash: None.

B. Window Stools:

1. 3/4-inch- thick, solid surface material.

C. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

D. Joints:
1. Fabricate countertops in sections for joining in field.

a. Joint Locations: Not within 18 inches (450 mm) of a sink or cooktop and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.

E. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Window Stools: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install window stools level to a tolerance of 1/8-inch in 8 feet (3 mm in 2.4 m), 1/4-inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten solid surface material by screwing through corner blocks of base units into underside of window stool. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match solid surface material, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into corner blocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned, and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. **Fiber entrance matting system with recessed frame.**

1.3 COORDINATION

A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

B. Shop Drawings:

1. Items penetrating floor mats and frames, including door control devices.

2. Divisions between mat sections.

3. Perimeter floor frames.

4. Custom Graphics: Scale drawing indicating colors.

C. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Mat: Assembled sections of floor mat. Samples for each type and color.

2. Tread Rail: Sample of each type and color.

3. Frame Members: Sample of each type and color.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient-Tile Entrance Mats: Full-size tile units equal to **2** percent of amount installed, but no fewer than **10** units.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Uniform floor load of **300 lbf/sq. ft. (14.36 kN/sq. m)**.

2. Wheel load of **350 lb (159 kg)** per wheel.

B. Accessibility Standard: Comply with applicable provisions in **the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1**.

C. Basis of Design: **Matter Surfaces – Recessed Grate Grid System with Super Nop 52 fiber matting.**
1. Color: **Match Architect's sample**.

2. Mat Size: **As indicated** on Drawings.

3. Mat Type: **Recessed.**

4. Fiber Matting:
   a. Style: Super Nop 52
   b. Colors: Charcoal (Field), Azure (logo accent), Forest (logo accent), and Dark Grey (logo accent)

D. Graphics: Custom inlaid or woven-in graphic **logo and lettering** as indicated on Drawings.

2.2 FRAMES

A. Recessed Frames: Manufacturer's standard extrusion.

1. Extruded Aluminum: ASTM B221 (ASTM B221M), Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.

   a. Color: **Clear** Anodized.

2.3 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.4 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.

1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, **AA-M12C22A41, Class I, 0.018 mm** or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, **minimum recess depth,** and other conditions affecting installation of floor mats and frames.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed mat frames and mats to comply with manufacturer's written instructions so that tops of mats will be flush with adjoining finished flooring. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.

1. For installation in terrazzo flooring areas, allow for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.

2. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.

3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

4. Delay setting mats until construction traffic has ended.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124813

SECTION 220010 - BASIC PLUMBING REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 22.

1.2 SCOPE OF WORK

A. Include in bid all labor, materials, tools, plant, transportation, excavation, equipment, insurance, temporary protection, permits, taxes and all necessary and related items required to provide complete and operational systems shown and described.

B. References to Codes and Standards called for in the Contract Documents mean the latest edition, amendment and revisions to the codes and standards in effect on the date of these Contract Documents.

C. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports.

2. Fire Stopping.

3. Cutting and Patching.

D. Contract shall include, but not be limited to:

1. Plumbing.

1.3 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies.

B. The following is a list of Codes and Standards that will apply to this project:

1. 2020 Building Code of New York State (BCNYS).

2. 2020 Existing Building Code of New York State (EBCNYS).

3. 2020 Energy Conservation Construction Code New York State (ECCCNYS).

4. ASHRAE Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings.

5. 2020 Plumbing Code of New York State (PCNYS).

6. New York State Department of Labor Rules and Regulations.

7. Federal Occupational Safety and Health Administration - OSHA.

8. National Life Safety Code, NFPA 101.

9. National Electrical Code, NFPA 70.

10. Local Codes and Ordinances for Town of Cicero

11. NEMA Standards.

12. Underwriters Laboratory (UL).

13. Factory Mutual and/or Owner's Insurance Carrier.

14. National Fire Protection Association (NFPA) - All chapters.

15. New York State Education Department - "Manual of Planning Standards".

16. Town of Cicero Plumbing Department.

1.4 LICENSING & PERMITS

A. The Contractor shall hold a license to perform the work as issued by the State of New York.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid.

C. Refer to General Conditions of the Contract for additional requirements.

1.5 GLOSSARY

ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
AWWA	American Water Works Association
EIA	Electronic Industries Association
FCC	Federal Communications Commission

FM	Factory Mutual Insurance Company
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYBFU	New York Board of Fire Underwriters
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
SHI	Steel Boiler Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
TIA	Telecommunications Industry Association
UFPO	Underground Facilities Protective Organization
UL	Underwriter's Laboratories, Inc.

1.6 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN.
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner’s Representative.
Owner’s Representative	The Prime Professional
Prime Professional	Architect or Engineer having a contract directly with the Owner for professional services.
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.

Rough-in	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.7 BASIS OF DESIGN

A. The contract documents are prepared on basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Make required changes in work of all other trades, at no increase in any contract. Provide larger motors, electrical feeders, circuit breakers, equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of roughing and connections by other trades. Remove and replace door frames, access doors, walls ceilings or floors required to install other than design make equipment. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.8 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Owner's Representative.

1.9 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation .dgn format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. A request must be made in writing to the Engineer with the requested individual files. The contractor will then be sent a CAD Release Form and must sign the form to obtain electronic drawings.

1.10 QUALITY ASSURANCE

A. Manufacturers of equipment shall be firms regularly and currently engaged in the production of equipment and accessories provided. The design and size of each item of equipment provided for this project needs to have been in satisfactory and efficient operation on at least three (3) installations for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

C. Apply and install materials, equipment, and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Owner's Representative for resolution.

D. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching.

E. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

2.0 PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL MINIMUM REQUIREMENTS

A. Provide Materials That Meet the Following Minimum Requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.

2. All equipment and material for which there is a listing service shall bear a UL label.

3. Potable water systems and equipment shall be built according to AWWA Standards.

4. Gas-fired equipment and system shall meet AGA Regulations and shall have AGA/CSA label.

5. Electrical equipment and systems shall meet UL Standards and requirements of the N.E.C. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.

6. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

7. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.2 SUBSTITUTIONS

A. The Materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted in writing to the Architect and Engineer a minimum of ten (10) days prior to the date for receipt of Bids.

1. Each request shall include the name of the proposed material or equipment being substituted, cut sheets, installation drawings, performance and test data, warranties and location of three(3) similar installations with reference names of Owner or Facility personnel responsible for maintaining equipment.

2. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders.

C. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are unacceptable and will not be considered.

2.3 FACTORY-ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of same manufacturer.

2. Constituent parts which are alike shall be product of a single manufacturer.

3. Components shall be compatible with each other and with the total assembly for intended service.

4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment which serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATIBILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

2.5 SPECIAL TOOLS

A. If any part of equipment requires a special tool for assembly, adjustment or maintenance thereof and such tool is not readily available on commercial tool market, it shall be furnished by the Contractor.

2.6 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36
2. Cold-Formed Steel Tubing - ASTM A 500
3. Hot - Rolled Steel Tubing - ASTM A 501
4. Steel Pipe - ASTM A 53, Schedule 40, welded.

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.7 FIRE STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants.
2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
3. Thomas & Betts - S-100 FS500/600,
4. Carborundum Fyre Putty.

3.0 PART 3 - EXECUTION

3.1 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections.

B. Shop drawings shall be dated and contain the following information. Incomplete submittals will not be accepted. Number each submittal.

1. Name of project.

2. Name of prime professional.

3. Name of prime contractor.

4. Description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.

C. All products specified in an individual Division 22 section shall be submitted at the same time.

D. Indicate deviations from contract requirements on Letter of Transmittal.

E. Corrections or comments made on the Shop Drawings during the review do not relieve Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

3.2 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings drawn at not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings As Follows:

1. HVAC Contract will prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be in AutoCAD format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, lighting fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Reposition proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of Base Bid Contracts. Minor revisions need not be redrawn.

2. HVAC Contract will provide AutoCAD files and/or prints and submit the base plan to all major trades' Contractors.

3. Electrical, Plumbing and Fire Protection Contracts will each draft location of piping, conduits and equipment on the base plan as provided by the HVAC Contract such that a complete coordination of all trades is represented, and areas of conflict and recommended resolutions are noted.

4. Do not install equipment, equipment foundations or piping until Coordination drawings have been approved.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for Construction Safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature required to provide safe conditions for all workmen and site visitors.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Prior to beginning work inspect and test all existing systems that will be affected by the work in this contract. Provide a report to the Owner indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.

B. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the Owner prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, that is determined to have been caused by the work in this contract.

C. The Owner’s representative shall determine if the contractor has damaged existing systems or construction and approve the repairs.

3.5 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the Owner’s asbestos management plan. Prior to performing such work identify areas containing asbestos, notify the Owner so that they may make arrangements for abatement and/or containment prior to work proceeding. The contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 Sections for further requirements.

3.6 REMOVALS

A. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that Owner wishes to retain that do not contain asbestos material shall be delivered to location directed by Owner. Items that Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated, Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, tubing, supports, fixtures, etc. Visit each room, crawl spaces and roofs to determine total Scope of Work.

B. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all pipe, valves, fittings, insulation, conduit, panels, and all hangers, including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, conduits and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

C. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction.

3.7 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems and building. Perform first seasons winterizing in presence of Owner's operating staff.

3.8 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Owner’s representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.

2. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owner’s representative or other contractor for any “rough ins” that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by this contractor at no expense to the Owner.

3. For equipment and connections provided in this contract, prepare roughing drawings as follows:

   a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.

   b. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

3.9 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction," for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch, cut or abandoned holes left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.10 CONCEALMENT

A. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.11 CHASES

A. New Construction:

1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of "General Building Construction Plans and Specifications." Mechanical and Electrical Trades work shall provide all other openings required for their contract work.

2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.

3. Assume responsibility for correct and final location and size of such openings.

4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2 inches above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.

6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction Contractor.

B. In Existing Buildings:

1. Drill holes for floor and/or roof slab openings.

2. Multiple pipes smaller than 1" properly spaced and supported may pass through one 6" or smaller diameter opening.

3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2 inches above floors.

4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire-stopping similar to that for floor openings.

3.12 FIRE-STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Wall and Floor Assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.

3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

4. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Apply fire stopping within the temperature and humidity limits permitted by the manufacturer.

6. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.13 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Supports shall meet the approval of the Owner's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For Precast Panels/Planks and Metal Decks, support plumbing work as determined by manufacturer and Owner's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.14 PAINTING

A. This Contract Includes the following:

1. Painting for all cut and patch work performed as part of Division 22 contract.

2. Painting required for touch-up of surfaces damaged due to the installation of division 22 work.

3. Painting as required to repair finish of equipment furnished.

4. Refer to Division 9 Sections for general description of materials and methods.

5. Painting as called for on Division 22 Drawings.

3.15 ADDITIONAL ENGINEERING SERVICES

A. In the event that the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's expenses in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

B. In the event that the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's expense in connection with such additional services shall be paid by the Contractor and may be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant’s hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

3.16 ALL TRADES TEMPORARY HEAT

A. Refer to the Standard General Conditions of the Contract for Construction and Supplemental General Conditions.

3.17 TEMPORARY FACILITIES

A. Refer to the standard General Conditions of the contract for Construction and Supplemental General Conditions.

1. Continuity of operation of existing facilities will require temporary installation or relocation of equipment and piping.

2. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.

3. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining pressurized.

3.18 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

3.19 PLUMBING EQUIPMENT CONNECTIONS

A. Provide complete plumbing connections to all plumbing equipment. Provide control connections to equipment where indicated on the drawings. Provide valves on piping ahead of each piece of equipment.

B. Provide all piping, trim, accessories and connections as required for proper equipment operation of Equipment provided by this contract, Owner-Furnished Equipment and Equipment furnished by other contracts,

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.20 PLUMBING INSTALLATIONS

A. All installations shall comply with the following requirements:

1. Coordinate plumbing systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.

2. The Architect shall control the placement of all wall and ceiling mounted plumbing equipment and devices in all rooms with the exception of mechanical and electrical equipment rooms. When drawing details are not available, consult with the Architects representative for actual location.

3. Verify all dimensions with field measurements.

4. Arrange for all chases, slots and openings in other building components, which are not indicated on drawings, to allow for plumbing installations.

5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

6. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule.

7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

8. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer the conflict to the Architect.

9. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

10. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

11. All tolerances in alignment and leveling, and the quality of workmanship for each stage of work shall be as required by the manufacturer and subject to approval by the Owner’s representative.

12. All finished equipment surfaces damaged during construction shall be brought to "as new" condition by touch up or repainting. Any rust shall be removed and primed prior to repainting.

13. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

14. No plumbing equipment shall be hidden or covered up prior to inspection by the Owner's representative. All work that is determined to be unsatisfactory shall be corrected immediately.

15. All plumbing work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

16. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his approval. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

17. Install access panels or doors where units are concealed behind finished surfaces.

3.21 ELECTRICAL EQUIPMENT CONNECTIONS

A. Provide complete power connections to all electrical equipment. Provide control connections to equipment where indicated on the drawings. Provide disconnect ahead of each piece of equipment. Ground all equipment in accordance with the latest edition of the NEC.

B. Provide all power wiring, electric equipment, switches, and connections as required for proper equipment operation of Owner-Furnished Equipment and Equipment furnished by other contracts. Provide control wiring where noted in the documents.

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.22 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary plumbing and electrical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing facilities or services.

3.23 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owner's designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed prior to acceptance repeat the instructions if asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer's certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e. variable frequency drive and pumps) both manufacturers shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up including problems that occurred and their method of resolution.

C. Refer to Division 1 Sections for additional requirements.

3.24 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items. Bind above items in a three ring binder with name of project on the cover. Deliver to Owner's Representative before request for acceptance.

3.25 RECORD DOCUMENTS

A. Prepare and provide record documents in accordance with Division 1 Sections. In addition to those requirements provide the following:

1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.

2. Take dimensions from a given fixed bench mark, such as the corner of a building, and neatly and clearly indicate same on Record Drawings.

3. Provide Record Drawings for all Contract Work.

4. Incorporate all field changes, change orders and other modifications into the final Record Drawings.

END OF SECTION 220010

SECTION 220502 - PLUMBING PIPING SYSTEMS AND ACCESSORIES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Schedule of all pipe materials, fittings and connections to be utilized on this Project.

1. Pipe and fitting material data sheets identifying compliance with specified approvals and listings.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. All piping and fittings used on this Project shall be new and marked with manufacturer's name; and shall comply with all applicable ASTM and ANSI Standards.

2.2 COPPER PIPE AND SOLDER FITTINGS

A. Pipe, Above ground: Hard temper, ASTM B88; Type K, L, M, or DWV, as called for. Soft temper only as called for. Plans show copper tube sizes.

B. Pipe, Below ground: Soft temper, ASTM B88; Type K. Hard temper, ASTM B88; Type DWV. Plans show copper tube sizes.

C. Tees, Elbows, Reducers: Wrought copper; solder end connections; ASME B16.22; ASTM B828.

1. Cast copper alloy fittings are prohibited for medical vacuum piping systems.

D. Unions And Flanges:

1. 2 inch and smaller: Unions, solder type, wrought copper, ground joint, 150 lb. swp.

2. 2-1/2 inch and larger: Flanged, wrought copper, companion type, ASME drilled, solder connection, 150 lb. swp.

E. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. No-lead solder and flux shall comply with requirements of NSF-372, ASTM B813, ASTM B32.

2. Make: Harris "Bridgit", Lucas-Milhaupt Warwick "Silverbright 100", Canfield Technologies "100% Watersafe".

2.3 SOIL PIPE AND FITTINGS

A. Pipe: ASTM A74 service weight cast iron, coated.

B. Fittings: Service weight type with "push-on" type fittings with ASTM C564 extra heavy neoprene gasket of same manufacturer as piping.

C. No-Hub:

1. Pipe: ASTM A888 no-hub cast iron, coated.

2. Fittings: Cast iron no-hub pattern with neoprene gasket and 24 gauge, Type 304 stainless steel heavy duty clamp assembly; ASTM C1540.

a. Make: Charlotte Pipe, Clamp-All, Husky, Tyler "Widebody".

2.4 SPECIAL FITTINGS

A. Copper To Cast Iron: Cast bronze, cast iron to sweat adapter.

B. Copper To Steel Piping:

1. Cast bronze copper to iron male or female adapter with shoulder for drainage piping only.

2. Dielectric pipe fittings.

2.5 DIELECTRIC PIPE FITTINGS

A. Tensile strength, ASME B16.8, union 250 psi, or flange design, 175 psi, pressure rating, at 210 Deg. F, threaded or solder joint, constructed to prevent gasket from squeezing into internal opening.

B. Acceptable Manufacturer: Epco, Capitol Manufacturing, Watts, or approved equal.

2.6 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: Anvil International, Carpenter & Patterson, Cooper B-Line, PHD Manufacturing.

B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated or PVC coated where in contact with copper piping. Cadmium plated or galvanized for non-copper piping.

2. Adjustable ring type where piping is installed directly on hanger for piping 3 inch and smaller.

3. Adjustable steel clevis type for piping 4 inch and larger.

4. Nuts and rods with electroplated zinc or cadmium (0.005 inch minimum) finish.

C. Spacing Schedule:

1. Pipe Hangers:

a. Plumbing Piping: Hanger spacing shall comply with Section 308 and Table 308.5 of the 2020 Plumbing Code of New York State (PCNYS).

D. Piping systems with material not listed above, supported and protected in accordance with manufacturer's recommendations.

E. Concrete Inserts: Zinc plated steel body, malleable iron nut. MSS SP-58 Type 18.

1. Insert for Lightweight Concrete: Anvil Fig. #285, maximum loading 400 lbs.

2. Insert for Concrete: Anvil Fig. #281, maximum loading 1,000 lbs.

F. Supports:

1. For weights under 1000 lbs.: "Drill-In" inserts equal to Phillips "Red Head" "U" Channel, beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.

2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs.

3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.

G. Trapeze Hangers:

1. Hangers shall be supported with rod sized with a safety factor of four.

2. May be manufactured type "U" shaped channel, or suitable angle iron or channel.

3. Securely fasten piping to trapeze with "U" bolt or straps, dissimilar metals shall not touch, use isolation gaskets.

4. Acceptable Manufacturer: Globestrut, Kindorf, Unistrut, B-Line, or approved equal.

H. Pipe Insulation Shields:

1. Galvanized steel shields, minimum 180° arc, unless otherwise indicated. MSS SP-58 Type 40.

2. Shields for use with hangers and supports per the following schedule:

Pipe Size	Shield Length	Shield Gauge
1/2" – 3”	12”	18

2.7 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves. Chrome plated in finished areas and at plumbing fixtures.

B. Cleanout plugs, bushings, nipples, required for instruments and gauges to be brass.

2.8 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces.

2. Sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18-gauge minimum and braced to prevent collapsing.

2.9 SEALING ELEMENTS

A. Waterproof Type:

1. Exterior walls, below grade, and above basement or vault floor: Synthetic rubber material with zinc plated bolts.

2. Design Equipment: Garlock "Link-Seal".

3. Acceptable Manufacturers: Garlock, Flexicraft, or Roxtec.

2.10 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814.

B. Firestop system seals shall be provided at locations where piping pass through fire rated wall, floor/ceiling, or ceiling/roof assembly.

C. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.11 PIPING MATERIALS AND SCHEDULE

A. See Exhibit P1, "Plumbing Piping Materials", at end of this Section for general plumbing piping systems.

3.0 PART 3 - EXECUTION

3.1 EQUIPMENT AND SYSTEMS

A. Install equipment and systems in accordance with provisions of each applicable Section of these Specifications, and Local/State Codes/Regulations having jurisdiction.

B. Accurately establish grade and elevation of piping before setting sleeves.

C. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring.

D. Arrange piping at equipment with necessary offsets, unions, flanges, and valves, to allow for easy part removal and maintenance.

E. Offset piping and change elevation as required to coordinate with other Work. Avoid contact with other mechanical or electrical systems. Make changes in direction and branch connections with fittings.

F. Provide adequate means of draining and venting units, risers, circuits and systems.

G. Conceal piping unless otherwise called for. Do not install valves, unions and flanges in inaccessible locations.

H. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction.

I. Install piping parallel with lines of building, properly spaced to provide clearance for insulation.

J. Materials within a system and between systems shall be consistent. If this is not possible, install dielectric fittings.

K. Plastic pipe is prohibited in plenums and stairs. Plastic pipe shall not be installed exposed in places of assembly.

3.2 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, or from other piping, nor by vertical expansion bolts. Support piping with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location; replace if not suitable. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing, using proper diameter rod for pipe size.

B. Provide additional structural steel members, having one coat rustproof paint, where required for proper support.

C. Provide oversized hangers where insulation/supports must pass between pipe and hanger.

1. Provide pipe insulation shield at all points of support for insulated piping. Center shields on all hangers and supports outside of insulation. Install shields in manner to prevent cutting or puncturing insulation jacket.

D. Provide continuous support or extra supports for plastic pipe per manufacturer's requirements.

E. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible; "C" type not permitted on joists.

F. Use trapeze hangers where a group of piping can be installed.

3.3 PIPE CONNECTIONS

A. No-Lead Solder Connections: Nonacid flux; clean off excess flux and solder. Solder and flux shall comply with requirements of NSF-372.

B. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specifically selected for each application.

3.4 SLEEVES

A. Provide for pipes passing through floors, walls or ceilings. Not required for existing floors that are core-drilled, except where floor is waterproofed. Extend 1/8 inch above finished floor in finished areas.

B. Use steel pipe sleeves in bearing wall, structural slabs, beams and other structural surfaces, and where called for.

C. Sleeves shall be as small as practical, consistent with insulation, so as to preserve fire rating.

D. Fill abandoned sleeves with concrete.

3.5 SLEEVE PACKING

A. Seal Void Space At Sleeves As Follows:

1. Interior locations: Firmly pack with fiberglass and caulk.

2. Exterior walls above grade: Use link-seal or approved sealing element.

3. Exterior walls below grade and above basement or vault floors: Use link-seal.

4. Cored holes: Use sealing element.

5. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods.

6. Waterproofed floors: Use waterproof sealing element, device or compound.

3.6 ESCUTCHEON PLATES

A. Provide polished chrome escutcheon plates for all exposed piping passing through floors, walls or ceilings, in all rooms except in Boiler, Fan and Mechanical Rooms.

3.7 TESTS

A. Refer to other Division 22 Sections for testing of Plumbing Systems.

3.8 PIPE LINE SIZING

A. Pipe sizes called for are to be maintained. Pipe size changes made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT "P1" – PLUMBING PIPING MATERIALS

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Domestic water interior/hot, cold and circulating 3" and smaller	Type L copper	Wrought copper	No-lead solder
Indirect waste piping	Type L copper, Type DWV copper	Wrought copper	No-lead solder
Storm Piping (not buried)	Service weight cast iron soil pipe or Type DWV copper	Cast iron hub and spigot, No-hub or wrought copper; drainage pattern	Neoprene gasket compression type, no-hub neoprene gasket and stainless steel clamp assembly or no-lead solder
Storm Piping (buried)	Service weight cast iron soil pipe	Cast iron hub and spigot	Neoprene gasket compression type

END OF SECTION 220502

SECTION 220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. All valves and accessories listed under “Part 2 – Products” of this Section.

1. Submit cut sheets, specifications and dimensioned drawings.

2. Submit compliance with ANSI/NSF-372 for valves intended to supply drinking water.

2.0 PART 2 - PRODUCTS

2.1 VALVES - GENERAL

A. Valves shall have following requirements:

1. Working pressure stamped or cast on bodies per MSS SP-25.

2. Stem packing serviceable without removing valve from line and shall be free of asbestos.

B. Makes:

1. Check valves: Jomar, Milwaukee, Nibco, Watts.

2. Ball valves: Apollo (Conbraco), Jomar, Milwaukee, Nibco, Watts.

3. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

2.2 CHECK VALVES

A. Swing check valves:

1. 2 inch and smaller: Bronze, 200 wwp. Threaded ends, Nibco T-413-Y-LF. Solder ends, Nibco S-413-Y-LF. Provide in horizontal positions only.

B. Silent (Spring) check valves:

1. 2 inch and smaller: Bronze body, PTFE disc, stainless steel spring and stem, 200 wwp. Threaded ends, Nibco T-480-Y-LF. Solder ends, Nibco S-480-Y-LF. Provide in vertical or horizontal position.

2.3 BALL VALVES

A. 2 inch and smaller: Lead-free brass body with hard chrome-plated lead-free brass ball and stem, full port opening, teflon seats, end entrance, 600 #WOG, 150 #WSP. Threaded ends, Watts LFFBV-3C. Solder (sweat) ends, Watts LFFBVS-3C.

1. Valve shall have separate packing nut and handle nut.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment and fixtures.

2. Use extreme care and caution when soldering valve connections to piping to prevent valve seat damage. Apply heat with the flame directed away from the center of the valve body. Inspect all valves after soldering, tighten valve packing nut and make adjustments if required to ensure valve operates properly. Replace all damaged valves.

3. Provide valves where shown on Contract Drawings.

4. Locate swing check valves in horizontal position only.

END OF SECTION 220523

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

A. Submit product data for each identification material and device, and for all items specified under “Part 2 - Products” of this Section.

B. Submit valve schedule for all piping systems typewritten on 8 1/2 inch x 11 inch paper, indicating code number, location and valve function. Submit with O&M Manuals.

C. Submit schedule of piping, equipment and valve identification for review before labeling. Confirm naming/numbering is consistent with Owner’s naming/numbering convention prior to labeling.

1.4 ACCEPTABLE MANUFACTURERS

A. Brady Co., Brimar Industries, Craftmark, Seton, or approved equal.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Provide manufacturer's products of categories and types required for each application.

2.2 PIPING IDENTIFICATION

A. Pipe Labels (Inside buildings):

1. Piping/Insulation with outside diameter of 5-7/8 inches and less: Provide acrylic plastic wrap-around type markers with directional flow arrows, UV resistance and legend printed four (4) times for 360° visibility. Make: Seton “Setmark” snap-on wrap around type pipe markers.

B. Pipe labels shall conform to the following identification table:

PIPE SERVICE	IDENTIFICATION/LABEL
Indirect Waste (condensate drain)	INDIRECT WASTE

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify all plumbing services with 1/4" letters above the valve number ("PLBG."). Attach to valves using brass "jack" chain and brass "S" hook. Make: Seton Style No. M4507 tags, Style No. 16182 chain and Style No. 16195, 6 and 7 No. hooks.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room or in location as directed by the Owner.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project. Provide a valve tag chart for all valves provided on the project.

B. Provide piping identification with directional flow arrows for all piping provided on project.

1. Provide labels on straight runs of piping at 20'-0" intervals, minimum.

2. Provide labels where piping enters and leaves a partition, wall, floor or ceiling.

3. Adhesive type or stenciled labeling is unacceptable. Provide wrap-around type labels only.

END OF SECTION 220553

SECTION 220580 - PLUMBING PUMPS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

2.0 PART 2 - PRODUCTS

2.1 (CDP): condensate drain pump:

A. Shall be plenum rated condensate drain pump with the following:

1. 1 gallon collection tank
2. Fan cooled concentric motor
3. Vertical centrifugal pump with stainless steel motor shaft
4. Automatic start and stop operation
5. Float switch
6. Overflow detection: dual function NO and NC operation.
7. Power lead wires for hard wired connection by EC
8. Check valve
9. Two 1 1/8 inch inlet openings
10. Thermally protected.

B. Make: Little Giant model VCL-45ULS series.

1. Acceptable manufacturers: Goulds Pumps, Grundfos, Hydromatic, Libery, Weil, Zoeller.

3.0 PART 3 - EXECUTION

3.1 CONDENSATE PUMPS

A. Install pumps level and plumb.

B. Install basin in accordance with manufacturer’s written instructions. Connect inlet piping to basin where indicated on the contract drawings.

C. Install cover on basin so cover is flush with finished floor. For solid covers, provide gasket for connection to basin.

D. Install isolation valve and lift check valve in pump discharge pipe. Locate valves above floor level.

E. Install pumps in accordance with manufacturer's written instructions.

END OF SECTION 220580

SECTION 220700 - PLUMBING INSULATION

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

B. Plumbing insulation shall comply with the requirements of the 2020 Energy Conservation Construction Code (ECCCNYS).

1.2 SUBMITTALS

A. All items listed under “Part 2 – Products” of this Section.

1. Submit manufacturer’s data sheets.

B. Schedule of all insulation applications for this project.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Insulation, Jackets, Adhesives, And Coatings, Shall Comply With The Following:

1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments not permitted.

2. Insulation, including finishes and adhesives on the exterior surfaces of pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less; as tested by ASTM E84 (NFPA 255) and UL 723 methods.

3. Asbestos or asbestos bearing materials are prohibited.

2.2 PIPE INSULATION (RIGID TYPE)

A. Preformed rigid sectional pipe covering, 4 lb. nominal density fiberglass; ASTM C547, Class 1. White Kraft outer surface bonded to aluminum foil and reinforced with fiberglass yarn.

B. Maximum thermal conductivity (k), in units of Btu/sq. ft. hr. ^{o}F/in.:

Fluid Operating Temperature	Max. Thermal Conductivity	Mean Rating Temperature
40° F - 60° F	0.27	75° F
105° F - 140° F	0.28	100° F
Greater than 140° F	0.29	125° F

2.3 PLASTIC JACKETING

A. PVC jacket, UV-resistant, 20 mill thickness; ASTM D1784, Class 14253-C. Solvent adhesive welded joints.

2.4 MAKE

A. Fiberglass: Certainteed, Knauf, Johns Manville, Owens-Corning, or approved equal.

B. Adhesives: Childers, Foster Products, Tremco; numbers designate quality of adhesive.

2.5 INSULATION INSERTS

A. General: For use where direct firm support and/or load restraint of piping system is required. May be used for general support at hanger or trapeze locations at contractor's option.

B. Pre-insulated Type: High density, 100 psi waterproofed calcium silicate, 360° insert.

1. Insert shall be same thickness as adjoining pipe insulation and extend 1 inch beyond metal pipe insulation shield.

2. Make: TPS / TPSX by SPI (Specialty Products & Insulation), or approved equal.

C. Field Insulated Type: High density fiberglass block, designed to eliminate compression of pipe insulation.

1. Insert shall be same thickness as adjoining pipe insulation. Number of blocks as recommended by manufacturer for size of pipe being supported.

2. Make: H-Block by ICA, Inc., or approved equal.

2.6 MATERIALS AND SCHEDULES

A. See Exhibits at the end of this section.

3.0 PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide Thermal Insulation:

1. Insulation is required on piping unless otherwise called for.

2. Install insulation only on clean, dry surfaces and after work has been tested.

3. Install insulation on cold surfaces with continuous unbroken vapor seal.

4. Exposed surfaces shall be white.

5. Pipes shall be individually insulated.

B. Install insulation, accessories, coverings and jackets in accordance with manufacturer's installation instructions.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed.

B. Piping In Exterior Walls, Spaces, Overhangs, Attics, and Or Where Subject To Freezing: Insulate pipe with double the thickness called for.

1. Piping In Wall Chases: In addition to the above, pack chase with loose glass fiber insulation.

C. Joints In Section Pipe Covering Made As Follows:

1. Standard: Longitudinal laps and butt joint sealing strips cemented with Foster 85-20 or factory applied pressure sensitive adhesive lap seal. Stapled with outward clinching staples.

2. Vapor barrier: For cold services, Longitudinal laps and 4 inch vapor barrier strip at butt joints shall be sealed with white Foster 85-20. Seal ends of pipe insulation at valves, flanges, and fittings with white Foster 85-20.

D. Insulation Inserts:

1. Install insulation inserts in accordance with manufacturer's installation instructions. Contractor has option for pre-insulated type or field insulated type.

2. Pre-insulated Type: Butt insulation to insert and apply a wet coat of vapor barrier cement to the joints. Seal joints with 3 inch wide vapor barrier tape.

3. Field insulated Type: Provide high density fiberglass blocks between pipe and metal pipe insulation shield.

E. Pipe Insulation Shields:

1. Refer to Section 220502, Plumbing Piping Systems and Accessories, for requirements.

2. Provide pipe insulation shield at all points of support for insulated piping. Center shields on all hangers and supports outside of insulation. Install shields in manner to prevent cutting or puncturing insulation jacket.

F. Fittings, Valves And Flanges:

1. Hot and cold water:

a. Concealed: Insulating cement of the same thickness as adjacent pipe insulation. Cold water to be vapor sealed with Foster 30-36 "Seal-Fas".

b. Exposed: Premolded fitting covers of the same material and thickness as the adjacent pipe insulation and finished with glass cloth applied and coated with Foster 30-36 "Seal-Fas."

2. Optional: In lieu of the standard method above, the Contractor has the option of using Zeston, Ceel-Co, or Proto. Tape all joints at covers.

a. Fitting covers shall have fiberglass insulation inserts from the factory. Insulation inserts shall have 1.5 pcf minimum density; ASTM C553, Type III.

b. PVC fitting covers shall be UV-resistant.

3.3 RECOVERING

A. Field apply 6 oz. white glass cloth, cemented and applied over standard jacket. Properly cut at fittings to avoid wrinkles and coat with Foster 30-36. Leave ready for painting. Provide as called for.

3.4 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

3.5 EXISTING WORK

A. Insulate existing piping and equipment as called for on the Contract Drawings. Insulation material and thickness shall comply with Exhibits in this Section.

EXHIBIT "I" - PIPE INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	PIPE SIZE	INSULATION THICKNESS	REMARKS
Domestic cold water	Glass fiber	1-1/2" and larger 1-1/4" and smaller	1" 1/2"	
AC unit drains and overflows (Indirect Waste piping & pumped discharge piping)	Glass fiber	All sizes	1/2"	

END OF SECTION 220700

SECTION 220901 - ELECTRIC WIRING FOR PLUMBING SYSTEMS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

B. Provide “control” wiring circuits for equipment and associated control devices. Control wiring includes 120 volt and lower wiring for control signals directing equipment operation.

C. Provide certain “power” wiring as called for. Power wiring includes 120 volt and higher branch circuit wiring required for equipment operation.

D. Assistance, as required, and coordination with Division 26, “Electric”.

1.2 QUALIFICATIONS

A. Wiring installed in compliance with NEC, local governing codes, and applicable requirements of Division 26, “Electric”.

B. Wiring installed only by qualified electricians.

1.3 COORDINATION

A. Provide complete wiring diagrams for equipment and systems. Deliver wiring diagrams to proper parties in time for roughing of conduit, equipment connections, and avoid delay in construction schedule. Wiring diagrams and roughing information to clearly indicate items to be mounted and/or wired as part of the work of Division 26, “Electric”.

2.0 PART 2 - PRODUCTS

2.1 WIRING MATERIALS

A. Refer to Division 26 “Electric” for information regarding conduit, wire, insulation, wiring devices and methods.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

END OF SECTION 220901

SECTION 221100 - FACILITY WATER DISTRIBUTION

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 QUALITY ASSURANCE

A. Follow all requirements, recommendations and appendices of the following publications, codes, standards, and listings:

1. 2020 Plumbing Code of New York State (PCNYS).

2. ANSI/NSF-61, Drinking Water System Components – Health Effects.

3. ANSI/NSF-372, Drinking Water System Components – Lead Content.

1.3 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

B. Written certification for domestic water system tests. Submit with O&M Manuals.

C. Lab results from lead testing. Submit results to Owner, Owner’s Representative and Engineer.

2.0 PART 2 - PRODUCTS

2.1 DOMESTIC WATER SYSTEMS PIPING

A. Refer to Section 220502, “Plumbing Piping Systems and Accessories” for piping materials.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall conform to Article 1.2 of this section and shall be provided in a workmanlike manner as determined by the Owner's Representative and the Contract Specifications.

3.2 PIPING

A. Run all water piping slightly off level to low points. Provide drain valves and caps at all low points in the domestic water system.

B. Provide water hammer arrestors where shown or specified. Provide water hammer arrestors where solenoid or quick closing valves are installed. Refer to Section 223000, “Plumbing Equipment”.

C. Branch headers serving flush valves and fixtures shall be run full size to the last fixture being served unless otherwise noted.

D. All exposed water piping in kitchens shall be chrome plated brass from insulation to fixture or equipment connection.

E. All exposed water piping under fixtures shall be chrome plated brass.

F. Provide dielectric pipe fittings when connecting systems of dissimilar metals. Refer to Section 220502, “Plumbing Piping Systems and Accessories”.

G. Supply piping to all fixtures, faucets, shower accessories, hydrants and flush valves shall be anchored to prevent movement. Provide additional structural members and supports as required.

3.3 ASBESTOS PIPE

A. General: Existing water main piping and/or pipe insulation may contain asbestos. Cutting, drilling or other disturbance of this material shall be conducted as specified by New York State Department of Labor, Industrial Code Rule No. 56 "Asbestos". The methods and procedures specified in New York State Department of Labor, Industrial Code Rule 56 shall constitute minimum measures and shall in no way relieve the Contractor of sole responsibility for the means, methods, techniques, sequences or safety measures taken in connection with the work.

3.4 STERILIZATION

A. Provide sterilization of water piping in accordance with all requirements of the New York State Health Department, Public Water Supply Guides, Division of Sanitary Engineering, Bureau of Public Water Supply.

3.5 TESTS AND FLUSHING

A. Provide all necessary items to complete proper testing of all domestic water piping. Isolate existing systems as required.

B. Flush all water piping to remove debris, sediment, dirt, rust, corrosion and other foreign material. Flush all piping before connecting to fixture faucet and flush valves. Refer to Section 224200, “Commercial Plumbing Fixtures”. Utilize open pipe ends wherever possible.

C. Piping Supplying Domestic Water: Test at 125 psi hydrostatic pressure for two hours. All tests shall be witnessed by Engineer or Owner’s Representative.

D. A successful air test is not acceptable as the final test; however, the Division 22 contractor shall provide interim air testing of piping as construction progresses.

E. Make all leaks tight. No caulking of leaks shall be permitted. Remove and replace all defective fittings, piping and connections.

F. Collect bacteriological test samples after testing and flushing is complete. A minimum of two (2) samples shall be taken. Locations of samples shall be designated by the Owner's Representative. Collect samples in sterile bottles and send to NYS DOH approved laboratory for analysis.

1. Submit sample test results to Owner's Representative.

2. Contractor shall disinfect, flush and re-test domestic water piping until sample test results are satisfactory.

G. Required lead testing shall be provided by the School District. Lead testing shall be in accordance with the requirements outlined in the New York State Department of Health Regulation 10CRR-NY, Subpart 67-4, Lead Testing in School Drinking Water.

H. Pay all costs of tests. Perform all tests in a safe manner. Remove all discharged water resulting from testing procedures.

I. Certify in writing that all required domestic water tests have been conducted and successfully completed. Submit all certifications to the Owner's Representative.

END OF SECTION 221100

SECTION 221301 - FACILITY WASTE WATER SYSTEMS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 RELATED WORK

A. Basic Plumbing Requirements.

B. Plumbing Piping Systems and Accessories.

C. Identification for Plumbing Piping and Equipment.

1.3 SUBMITTALS

A. All items specified under “Part 2 - Products” of this Section.

B. Shop drawings for precast concrete interceptors. Shop drawings shall show all dimensions, inlet and outlet piping connections, access covers and risers, and water-tight joint details.

C. Submit written certification for sanitary, storm and vent piping system tests. Submit with O&M Manuals.

D. Submit written certification for testing the following items:

1. Condensate (indirect waste / pumped discharge) piping.

2.0 PART 2 - PRODUCTS

2.1 PLUMBING DRAINAGE SYSTEM

A. Refer to Section 220502, Plumbing Piping Systems and Accessories, for piping materials.

2.2 AREAWAY DRAIN (AD)

A. Type AD-A:

1. A.R.E. type floor receptor, 12 inches by 12 inches by 8 inches deep, aluminum anti-splash interior bottom dome strainer, anchor flange and heavy-duty rated grate . Make: Zurn Model Z645-AR. Or approved equal.

3.0 PART 3 – EXECUTION

3.1 GENERAL

A. Prior to commencing work, the Contractor shall verify all inverts and locations. Any discrepancy between the plans and field conditions shall be reported in writing to the Owner's Representative and Engineer within three (3) days of discovery. No work shall start until all discrepancies have been resolved. All costs related to Contractor's failure to verify and/or report discrepancies or problems will be borne by the Contractor.

3.2 AREAWAY DRAINS

A. Install areaway drains where shown on the Contract Drawings. Install in accordance with manufacturer's written instructions.

B. Level strainer with final floor finish. Clean strainer holes of all construction debris.

C. Maintain areaway drain body clean of debris during construction.

3.3 EQUIPMENT CONNECTIONS

A. Plumbing Contractor Shall:

1. Provide all roughing, and final waste and vent connections to condensate pumps and HVAC equipment requiring same as called for by the Contract Documents.

2. Refer to the Contract Documents for roughing schedules, equipment and lists indicating scope of connections required.

3. Provide adapters and all necessary piping, fittings and connections from roughing point to equipment.

3.4 INTERIOR PIPING INSTALLATION

A. Minimum Pitch:

1. Piping 3 inches and smaller: 1/4 inch per foot.

3.5 ASBESTOS PIPE

A. General: Existing sewer main piping may contain asbestos. Cutting, drilling or other disturbance of this material shall be conducted as specified by New York State Department of Labor, Industrial Code Rule No. 56 "Asbestos". The methods and procedures specified in New York State Department of Labor, Industrial Code Rule No. 56 shall constitute minimum measures and shall in no way relieve the Contractor of sole responsibility for the means, methods, techniques, sequences or safety measures taken in connection with the work.

3.6 TESTING

A. General: Provide all necessary items to complete proper testing of Work. Isolate existing systems as required.

1. Pay all costs of test. Perform all tests in a safe manner. Remove all discharged water resulting from testing procedures.

2. Provide written certification that tests have been conducted and successfully completed. Submit to Owner's Representative.

B. Pipe testing:

1. Test all sections of storm, sanitary, waste and vent piping installed by this Project. Test existing piping as called for.

2. Maintain 10 feet head of water above highest point of section being tested for a minimum of two hours, or until all joints are inspected and proved tight.

3. For interior piping, leaks of any volume detected in sewers or in floors or walls of appurtenant structures shall be permanently stopped. Should any leaks, defective joints or defective construction be found they shall be promptly made good. Should any defective pipes or specials be discovered they shall be removed and replaced with sound pipes or specials in a satisfactory manner at the Contractor's expense.

4. Air test not acceptable as final test.

END OF SECTION 221301

SECTION 230010 - BASIC MECHANICAL REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 23.

B. Section 019113 - Commissioning Requirements

1.2 SCOPE OF WORK

A. All portions of the work shown in the construction documents shall be bid by the Mechanical Contractor. Responsibility for performance of subcontractors and trades as lower tier contracts, such as electrical, shall be included as part of the Mechanical Contractor's scope of work.

B. Include in bid all labor, materials, tools, plant, transportation, excavation, equipment, insurance, temporary protection, permits, taxes, services and all necessary and related items required to provide complete and operational systems shown and described.

C. References to codes and standards called for in the Contract Documents mean the latest edition, amendment and revisions to the codes and standards in effect on the date of these Contract Documents.

D. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports
2. Access Doors and Panels
3. Fire Stopping
4. Cutting and Patching

E. Contract shall include, but not be limited to:

1. HVAC
2. General Contracting work as related to the HVAC Contract
3. Temperature Controls
4. Testing and Balancing of Mechanical Systems

1.3 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies having jurisdictional authority. In the event of conflict between these contract documents and the governing rules, regulations, and codes, the most stringent standards shall apply as directed by the Engineer and/or Authorities having jurisdiction.

B. Codes and standards that apply to this project include, but are not limited to:

1. 2020 Building Code of New York State (BCNYS)
2. 2020 Existing Building Code of New York State (EBCNYS)
3. 2020 Energy Conservation Construction Code of New York State (ECCCNYS)
4. 2020 Fire Code of New York State (FCNYS)
5. 2020 Fuel Gas Code of New York State (FGCNYS)
6. 2020 Mechanical Code of New York State (MCNYS)
7. 2020 Plumbing Code of New York State (PCNYS)
8. ASHRAE Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings.
9. New York State Department of Labor Rules and Regulations.
10. New York State Department of Health Regulations.
11. New York State Education Department - “Manual of Planning Standards”.
12. Federal Occupational Safety and Health Administration (OSHA) Regulations
13. Local Codes and Ordinances for North Syracuse, NY.
14. Factory Mutual and/or Owner’s Insurance Carrier
15. New York Board of Fire Underwriters.

1.4 LICENSING & PERMITS

A. The Contractor shall hold a license all necessary licenses to perform the scope of work at the project location.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid.

C. Refer to General Conditions of the Contract for additional requirements.

1.5 GLOSSARY

ADA	Americans with Disabilities Act
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FM	Factory Mutual Insurance Company
GAP	Global Asset Protection
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories, Inc.

1.6 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's Site Representative.

Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.
Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional, Construction Management, or other entity contractually authorized by the Owner for the services referenced.
Prime Professional	Architect / Architectural Entity or Engineer / Engineering Entity having a contract directly with the Owner for professional services.
Professional Engineer	Individual or Entity licensed to perform Engineering services in the State of New York
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Roughing	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.7 BASIS OF DESIGN

A. The contract documents are prepared on the basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Contractor shall provide changes in work of all other trades at no increase in any contract. Provide larger motors, electrical feeders, circuit breakers, equipment, additional control devices, valves, fittings and other miscellaneous equipment required for proper operation, and assumes responsibility for proper location of roughing and connections by other trades. Remove and replace door frames, access doors, walls, ceilings or floors required to install other than design make equipment. Contractor shall retain the ultimate responsibility for function of equipment and materials which are not the basis of design for the contract documents. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.8 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Owner's Representative.

B. In the event of conflict between the drawings and specifications, or discrepancies within either, this shall be brought to the attention of the Engineer for resolution prior to submission of bids. In the event that the contractor fails to note these discrepancies prior to submission of bids or in writing within their bid submission, the Engineer shall resolve the discrepancy such that the design intent is provided. The contractor shall provide all labor, materials and equipment to correct the installation deficiencies as defined by the Engineer.

1.9 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation 'dgn' format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. If the Contractor requests electronic CAD files from the Engineer and this request is granted, the Contractor shall submit application to the Engineer identifying each drawings to process the request.

1.10 QUALITY ASSURANCE

A. Manufacturers of equipment shall be firms regularly and currently engaged in the production of equipment and accessories provided. The design and size/capacity of each item of equipment provided for this project needs to have been in satisfactory and efficient operation on at least three (3) installations for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

C. Apply and install materials, equipment, and specialties in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Owner's Representative for resolution.

D. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching.

E. All work shall be done in a neat and workmanlike manner. All methods of construction or details of workmanship, not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and construction indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

F. In the absence of specific information within other sections of this project manual, all work of this project shall be provided with a one year labor and materials warranty against defects in equipment, materials and workmanship, starting from the date of project substantial completion.

2.0 PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL MINIMUM REQUIREMENTS

A. Provide materials that meet the following minimum requirements:

1. Materials shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, in accordance with NFPA 255.

2. All equipment and material for which there is a listing service shall bear a UL label.

3. Gas-fired equipment and systems shall meet AGA Regulations and shall have an AGA label

4. Electrical equipment and systems shall meet UL Standards and requirements of the NEC. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with UL Standards and the requirements of the NEC.

5. Communications equipment shall meet all FCC Regulations

6. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

7. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications.

2.2 SUBSTITUTIONS

A. The materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Proposed substitutions must be submitted in writing to the Architect and Engineer a minimum of ten (10) days prior to the date for receipt of Bids. Each request shall include the name of the proposed material, product or equipment being substituted, cut sheets, installation drawings, performance and test data, warranties and location of three (3) similar installations with reference names of owner or facility personnel responsible for maintaining equipment. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders. Failure to follow the guidelines described above may result in equipment being rejected at submittal based solely on failure to follow the above guidelines.

C. Approval by the Architect and/or Engineer to proceed with a substitution does not relieve the contractor from meeting all of the dimensional requirements and maintaining the full functionality and performance of the material, product or equipment used as the basis of design.

D. Electrical Design Changes Due to Mechanical Substitutions – It shall be the responsibility of all Contractors to transmit all changes of electrical characteristics to the Electrical Contractor which result from any substitutions PRIOR to starting any work. Any and all extra charges by the Electrical Contractor due to these changes are to be paid by the Contractor making the change.

E. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are unacceptable and will not be considered.

2.3 FACTORY-ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of the same manufacturer.

2. Constituent parts which are alike shall be products of a single manufacturer.

3. Components shall be compatible with each other and with the total assembly for intended service.

4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.

C. Components of equipment shall bear the manufacturer's name or trademark, model number and serial number on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment which serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATIBILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

2.5 SPECIAL TOOLS

A. If any part of equipment requires a special tool for assembly, adjustment or maintenance thereof and such tool is not readily available in the commercial tool market, it shall be furnished by the Contractor as required for the duration of the project and turned over to the Owner in serviceable condition upon completion of the scope of work. Contractor shall obtain written sign off by the Owner certifying that the Owner is in receipt of such tools.

2.6 SAFETY GUARDS

A. Provide guards on all shafts and couplings and all V-belt and sheave assemblies to prevent damage to equipment and injury to personnel.

2.7 LIFTING ATTACHMENTS

A. Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered without bending or distortion of shape, such as rapid lowering and braking of load.

2.8 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36

2. Cold-Formed Steel Tubing - ASTM A 500

3. Hot - Rolled Steel Tubing - ASTM A 501

4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal fasteners shall be zinc-coated (type, grade and class as required).

2.9 ACCESS DOORS AND PANELS

A. Steel access doors and frames shall be factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.

B. Provide access doors at all locations where equipment access for service, repair, and/or adjustment may be required. This shall include access to all air balance dampers. (In lieu of access to air balance dampers above hard ceilings or in chase walls, Contractor may submit for approval for use of remote regulators.)

C. Construction:

1. Frames:

a. 16 gage steel with 1 inch wide, exposed, perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast-in-place concrete, or ceramic tile.

b. 16 gage steel, perforated flanges with bead for gypsum or plaster wall board.

c. 16 gage steel with galvanized, expanded metal lath and exposed casing bead, welded to perimeter of frame for full bed plaster applications.

2. Access Doors:

a. Provide 14 gage sheet steel, flush panel doors with concealed, continuous, factory-installed piano hinge, primed and painted, set to open 175 degrees in unrated partitions.

b. Provide fire-rated, insulated, flush panel doors, with continuous piano hinge and self-closing mechanism rated for 1-½ hour “B” labeled, in fire-rated partitions.

3. Provide flush, screwdriver operated cam locks on all access doors.

4. Access doors shall be gasketed type where installed in rooms or spaces required to maintain a positive or negative pressure requirement to adjacent rooms or spaces.

2.10 CONCRETE BASES

A. Provide concrete bases for all floor mounted equipment. Provide 4000# concrete, chamfer edges, trowel finish and securely bond to floor by roughing slab and coating with cement grout. Provide a minimum of one ½” rebar dowel for every 2 sq. ft. base area, anchored 2” into floor and base to eliminate movement, minimum of 4 dowels per base. Bases shall be nominal 4” high unless otherwise indicated, shaped and size to accommodate equipment, and extend 4” beyond equipment footprint in all directions. Set equipment anchor bolts in sleeves before pouring. After anchoring and leveling, fill equipment bases with grout.

2.11 FIRE STOPPING

A. Fire-stopping for openings through fire and / or smoke rated walls and floor assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated by ASTM E814.

B. Submit for approval all fire stop systems and materials for approval by the Engineer

C. Acceptable Manufacturers:

1. Hilti Firestop Systems

2. Dow Corning Fire-Stop System Foams and Sealants.

3. Nelson Electric Fire-Stop System Putty, CLK and WRP.

4. Thomas & Betts - S-100 FS500/600,

5. Carborundum Fyre Putty.

3.0 PART 3 - EXECUTION

3.1 SUBMITTALS: SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections. Shop Drawings shall be dated and contain: name of project; name of prime professional; name of prime contractor; description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. Incomplete submittals will not be accepted. All products specified in an individual Division 23 Section shall be submitted at the same time. Number each submittal. Indicate deviations from contract requirements on Letter of Transmittal. Corrections or comments made on the Shop Drawings during the review do not relieve the Contractor from compliance with requirements of the drawings and specifications. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

B. Approval of shop drawings will not relieve this contractor from responsibility for deviations from the contract documents. It is the responsibility of the Contractor to meet the requirements of these documents. All errors or omissions in the product data are to be corrected by this contractor irrespective of any approvals by the Architect or Engineer.

C. Pre-test submittals must be written in report format, submitted and signed off on by the Owner and Engineer prior to the start of any construction work, including demolition.

D. Shop drawings include, but are not limited to, the submissions listed below. Refer to individual specification sections for specific requirements and additional submission requirements.

SECTION	DESCRIPTION	REQUIRED SUBMISSIONS
019113	Commissioning Requirements	Preliminary Commissioning Report Final Commissioning Report
230010	Basic Mechanical Requirements	Access doors Fire Stopping Special requirements related to substitutions Sheet metal shop / coordination drawings Operation and Maintenance Manuals Record Documents / Drawings
230130	Mechanical Cleaning of HVAC Systems	Shop drawings locating all proposed duct penetrations and ceiling access holes in plaster ceilings. Provide MSDS sheets on all solvents, cleaners and disinfectants to be used on project.
230509	Roof Curbs and Equipment Supports	Typical detail and schedule for equipment. Details shall include cross-sectional view illustrating clearly the type of curb being submitted, i.e. double wall insulated, with or without cant.
230513	Motors	Generally None Required.
230514	Electric Wiring	Complete wiring diagram for equipment and systems.
230519	Gauges and Thermometers	Manufacturer's data for each gauge and thermometer type. Submittal shall clearly designate where each device shall be utilized, including the scale range.
230523	Valves	Valves and accessories
230550	Wind Restraints for HVAC Systems.	Manufactures technical product data for wind restraint systems. Provide professional engineer stamped and signed calculations, and details of wind restraint systems to meet total design lateral force requirements for support and restraint of mechanical and electrical systems.

230553	Mechanical Identification	Manufactures technical product data and installation instructions for each identification material and device. Valve schedule for each piping system typewritten on an 8-1/2. X 11 in. (minimum) indicating code number, location and valve function. Schedule of pipe, equipment and name identification for review before stenciling or labeling. Confirm naming/numbering is consistent with Owner's convention.
230593	Testing, Adjusting and Balancing	Quality-Assurance Submittals Sample Report Forms Report of plan review for balancing devices necessary to achieve proper system balance but not specified Certified Testing, Adjusting, and Balancing Reports (including any specified pre-testing of systems) Warranty Documentation
230700	Insulation	Manufacturer data. Schedule of insulation applications. Certifications to demonstrate compliance specifications and governing regulations, including proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.
230923	Temperature Controls	Control System Submittal Pre-Commissioning Report As-Built documentation and drawings Operations and Maintenance Manuals / Closeout Documentation Training Agenda and Documentation Warranty
230963	Gas Monitoring Systems and Accessories	Product Data: Submit for approval the manufacturer’s technical product data for each component furnished as part of the gas detection system. Data shall include dimensions, capacities, performance characteristics, electrical requirements, and material finishes. Data shall also include installation and start-up requirements. Shop Drawings: Before commencing any work or ordering any materials, submit for approval drawings.

232000	Piping Systems and Accessories	Schedule of pipe materials, fittings, connections and accessories by piping system. Submittals for materials, fittings, expansion loops and support systems. Refrigeration piping system diagrams
232023	Pumps	Shop drawings and performance curves on pumps and pump accessories. Clearly indicate which equipment is being submitted.
232133	Water Systems Specialties	Shop drawings on water system specialties
233000	Sheet Metal and Ductwork Accessories	Shop drawings of all sheet metal equipment being provided. Submit a complete shop standard manual including construction details for all shop fabricated materials. Ductwork Detail Drawings. Exhaust and kitchen hood details.
233316	Fire and Smoke Dampers	Types, schedule of sizes, locations, and installation arrangements of all dampers. Manufacturers UL listed installation details for each mounting arrangement. Report of findings for all existing fire dampers to remain within or at the project perimeter.
233400	Fans	Shop drawings on fans, motors, drives, and accessories. Include all fan curves and fan operating point.
233600	Variable and Constant Volume Terminal Units	Terminal units by room number, maximum and minimum CFM, accessories, pressure drops, discharge and sound power data by octave band. Clearly indicate box sizes being proposed. Submit separately the controller and control interface devices being utilized.
233713	Registers and Diffusers	Registers/Grilles/Diffusers. Room schedule listing size, throw, direction of throw, accessories, finish, material type and color chart.
233726	Louvers and Penthouses	Louvers including all blade types, finishes and arrangements. Penthouses including materials, finishes and accessories. Provide original color charts for selection of finish

234000	Air Filters and Accessories	Filter product data including certification date, pressure drops at the scheduled airflow, schedule of filter sizes for each system. All filter accessories, including framing systems, fastening clips, manometers, and differential pressure gauges.
236423	Air Cooled Chiller with Remote Evaporator	Chiller and accessories. Power and control wiring diagrams, performance, dimensions, weights, installation and start up manuals.
237219	Air To Air Energy Recovery Equipment	Shop drawings on components and accessories. Installation details. Complete installation drawings, installation and start-up instructions, wiring diagrams, and instruction manuals from manufacturer of equipment.
237313	Indoor Air Handling Units	Shop drawings on air handling units.
237413	Packaged Rooftop Unit	Packaged rooftop unit and accessories. Complete installation details, drawings, installation and start-up instructions, wiring diagrams, and instruction manuals from manufacturer of equipment.
238116	Split System Air Conditioner	Split system air conditioner. Manufacturers wiring diagrams Refrigerant piping schematics showing accessories.
238210	Hydronic Gravity Heating Equipment	Shop drawings on gravity heating equipment with color selection chart. Clearly indicate which equipment is being submitted.
238216	Coils	Shop drawing on coils.
238219	Fan Coil Unit	Fan coil units and accessories including coil capacities, and filters.
238239	Cabinet Unit Heaters (Hydronic and Electric)	Unit heaters and cabinet unit heaters

3.2 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of color coded paper drawings or electronic files (dwg or rvt) not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings as follows:

1. Division 23 shall prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be AutoCAD format of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, light fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Re-position proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc. Provide these adjustments as part of Base Bid Contracts.

2. Coordination drawings to include positioning of fire, smoke and combination damper assemblies, associated actuators and access / inspection doors and shall consider ceiling construction in final positioning based on ceiling type on either side of partition or barrier for optimum result.

3. Division 23 will provide AutoCAD files and prints and submit the base plan to all major trades' Contractors.

4. Division 26 (Electrical), Division 28 (Communications), Division 22 (Plumbing) and Division 21 (Fire Protection) will each draft location of piping, conduits, equipment, etc. on the base plan as provided by Division 23 such that a complete coordination of all trades is represented and areas of conflict and recommended resolutions are noted.

5. Do not install any equipment, equipment foundations, ductwork, or piping until Coordination Drawings have been approved. Failure to receive approval prior to installation of the aforementioned items, will put the risk on the contractor to remove and reinstall at the engineer’s discretion. Additional time spent by the engineer in the field reviewing construction progress due to not receiving ductwork shop drawings and coordination drawings prior, will be considered an additional service by the consultant, which shall be paid by the contractor and deducted from any moneys owed to the contractor. The consultant’s hourly rate will apply.

3.3 PROTECTION OF PERSONS AND PROPERTY

A. Contractor shall assume responsibility for Construction Safety at all times and provide, as part of contract, all trench or building shoring, scaffolding, shielding, dust/fume protection, mechanical/electrical protection, special grounding, safety railings, barriers, and other safety feature(s) required to provide safe conditions for all workmen and site visitors.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Existing conditions are taken from field observations and prior construction documents and are not guaranteed. The contractor shall field verify all existing conditions. No allowance will be made for additional costs due to Contractors failure to verify existing conditions.

B. Prior to beginning work, inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the Owner prior to beginning work. If existing damage is not documented and submitted, the Contractor shall repair all damage found at the completion of the project that is determined to have been caused by the work of this contract. Repairs shall restore the area to like new condition.

C. The Owner's Representative shall determine if the Contractor has damaged existing systems or construction and shall approve the repairs.

3.5 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The Contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the Owner's asbestos management plan. Prior to performing such work, identify areas containing asbestos. Notify the Owner so that arrangements may be made for abatement and/or containment prior to work proceeding. The Contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 Sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to Division 2 sections for further requirements.

3.6 REMOVALS

A. Demolition of mechanical systems will include removal and deprogramming of multiple control system devices and sensors. Coordinate with Owner for quantity and type of devices which they desire to retain. Remove all components in good condition and turn over to the Owner's representative.

B. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that the Owner wishes to retain that do not contain asbestos or PCB Material shall be delivered to location directed by the Owner. Items that the Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos and/or PCB's shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated. Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, lighting, ductwork, tubing, supports, fixtures, etc. Visit each room, each crawl space and each roof to determine total Scope of Work. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all pipe and conduits to their source, valves, fittings, insulation panels, and all hangers, including the top connection and any fastenings to building structural systems. Where pipe and ductwork is removed and no new connections are planned or shown, cap, seal and insulate the pipe and ductwork which remains. Seal all openings, after removal of equipment, pipes, ducts, conduits and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

D. The shutting down of the existing HVAC systems shall be properly coordinated with the Owner. Provide the necessary personnel in shutting down the systems as necessary to facilitate the intended work. Water and glycol systems shall be fully drained prior to any removals. The Contractor shall propose to the Owner the points of isolation of the system to minimize the duration of the shutdown for draining, performing the necessary work and refilling of the system. Systems containing a glycol solution shall be drained in a manner to collect the solution in containers for storage or disposal. Glycol solution not utilized for refilling the systems upon completion of work shall be removed from the site and properly disposed of in a legal manner by the Contractor. Upon completion of removals and new work, the Contractor shall refill and vent the systems to return the systems back to their original operation condition.

3.7 STORAGE AND PROTECTION OF MATERIALS

A. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

B. Refer to "General Conditions of the Contract for Construction."

3.8 FREEZING AND WATER DAMAGE

A. Take all necessary precautions with equipment, systems and building to prevent damage due to freezing and/or water damage. Repair or replace, at no change in contract, any such damage to equipment, systems and building. Perform first seasons winterizing in presence of Owner's operating staff.

3.9 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Owner’s Representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location and mounting height of all equipment in finished areas, such as thermostats, fixtures, communication and electrical devices, including panels. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for Diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.

2. Before roughing for equipment furnished by Owner or in other contracts, obtain from Architect and other contractors, approved roughing drawings giving exact location for each piece of equipment. Do not "rough in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owner’s Representative or other contractor for any “rough ins” that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the Contractor at no expense to the Owner.

3. For equipment and connections provided in this contract, prepare roughing drawings as follows:

   a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.

   b. New equipment: Obtain equipment roughing drawings and dimensions, then prepare rough-in drawings.

4. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and manufacturer’s recommended service clearances to allow for required maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

D. All equipment requiring service and / or access shall be provided adequate clearances for this purpose. Any clearances described in manufacturer’s information, code requirements, etc., shall be taken into account in determining final rough-in positions. Reasonable access for maintenance and service shall be maintained.

E. Under no circumstances shall clearance be reduced from the MCNYS requirements for 30” x 30” level workspace in front of the control side of any appliance.

F. The most stringent standard, as determined by the Engineer, shall apply.

3.10 CUTTING AND PATCHING

A. Each trade shall include their required cutting and patching work unless shown as part of the General Construction work on the architectural drawings. Refer to "General Conditions of the Contract for Construction," for additional requirements. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch all abandoned penetrations left by removals of equipment or fixtures. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.11 CONCEALMENT

A. **Conceal all contract work** above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

3.12 CHASES

A. New Construction:

1. Certain chases, recesses, openings, shafts, and wall pockets will be provided as part of "General Building Construction Plans and Specifications." Mechanical and Electrical Trades work shall provide all other openings required for their contract work.

2. Check Architectural and Structural Design and Shop Drawings to verify correct size and location for all openings, recesses and chases in general building construction work.

3. Assume responsibility for correct and final location and size of such openings.

4. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.

5. Provide 18 gauge galvanized sleeves and inserts. Extend all sleeves 2" above finished floor. Set sleeves and inserts in place ahead of new construction, securely fastened during concrete pouring. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Firestop all unused sleeves.

6. Provide angle iron frame where openings are required for contract work, unless provided by General Construction Contractor.

B. In Existing Buildings:

1. Drill holes for floor and/or roof slab openings.

2. Multiple pipes smaller than 1" properly spaced and supported may pass through one 6" or smaller diameter opening.

3. Seal voids in fire rated assemblies with a fire-stopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge galvanized sleeves at fire rated assemblies. Extend sleeves 2" above floors.

4. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide fire-stopping seal between sleeves and wall in drywall construction. Provide fire-stopping similar to that for floor openings.

3.13 ACCESS DOORS AND PANELS

A. Provide access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.

B. Provide access doors, sized to permit compete access for all items requiring adjustment, such as balance dampers above solid ceilings.

C. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

D. Adjust hardware and panels after installation for proper operation.

E. Access doors and panels shall operate freely and be fully usable for their intended function.

3.14 FIRE-STOPPING

A. Fire-stopping for openings through fire and smoke rated wall and floor assemblies:

1. Provide materials and products listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

2. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire-rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for drywall construction.

3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

4. The methods used shall incorporate qualities, which permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

5. Apply fire stopping within the temperature and humidity limits permitted by the manufacturer.

6. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.15 FLASHING AND SEALING

A. Openings through roofs shall be flashed in a manner to not affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of the contract. Provide non-ferrous flashing pieces, skirts, hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Where openings for pipe/duct penetrate through roofs into equipment pipe chases, mechanical spaces or penthouses, the penetration of the roof deck/slab shall be sleeved, sealed and firestopped as required. Insulate at base of pipe chase, mechanical space or penthouse to match insulation value of the roofing system.

C. Apply all flashing and sealers within the temperature and humidity limits permitted by the manufacturer.

3.16 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, and other items to properly support contract work. Supports shall meet the approval of the Owner's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For Precast Panels/Planks and Metal Decks, support mechanical/electrical work as determined by manufacturer and Owner's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.17 GENERAL INSTALLATIONS REQUIREMENTS

A. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed

B. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule. Pay close attention to equipment that must be installed prior to building enclosure.

C. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

D. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

E. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

F. No equipment shall be hidden or covered up prior to inspection by the Owner's Representative. All work requiring inspection which is concealed prior to approval shall be re-opened for inspection at the Contractor's expense. All work that is determined to be unsatisfactory shall be corrected immediately.

G. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

H. Install access panels or doors where units are concealed behind finished surfaces.

3.18 ADDITIONAL ENGINEERING SERVICES

A. In the event the Consultant is required to provide additional engineering services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

B. In the event the Consultant is required to provide additional engineering services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Consultant is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owed to the Contractor.

C. In the event the Consultant is required to initiate design changes due to failure of the contractor to properly coordinate with the construction schedule, and / or other trades, then the Consultant's hourly rate and expenses in connection with such additional services shall be paid by the Contractor and shall be deducted from any moneys owned to the Contractor.

3.19 CLEANING

A. It is the Contractor's responsibility to keep clean all equipment and fixtures provided under this contract for the duration of the project. Each trade shall keep the premises free from an accumulation of waste material or rubbish caused by his operations. The facilities require an environment of extreme cleanliness, and it is the Contractor's responsibility to adhere to the strict regulations regarding procedures on the existing premises. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

B. Cleanliness of construction shall extend to include the interior and exterior surfaces of all equipment and systems provided under this contract. This includes, but is not limited to:

1. Unitary equipment exposed to occupant use (cabinet heaters, baseboard systems, etc.) Shall be thoroughly cleaned for final use both inside and out prior to project completion.

2. Equipment located in mechanical spaces shall be cleaned on the exterior such that no significant accumulation of debris or dirt is evident.

3. Interiors of all air handling equipment (rooftop systems, air handlers, etc.) shall be thoroughly cleaned on the interior such that no evidence of dust, dirt or debris remains prior to project turnover.

4. Ductwork systems – Ductwork shall be delivered to the job site with ends capped or covered to eliminate contamination during transportation and site storage. All open ends shall remain covered during the entire course of the construction process. Ductwork with evidence of dust, dirt or debris shall be thoroughly cleaned by an approved method prior project turnover.

3.20 HVAC EQUIPMENT CONNECTIONS

A. Provide final steam, condensate, hot water, glycol, chilled and condenser water, drain, vent, oil line and gas connections to all equipment as required by the equipment. Provide final connections, including domestic water piping, wiring, controls, and devices from equipment to outlets left by other trades. Provide equipment waste, drip, overflow and rail connections extended to floor drains.

B. Provide for Owner furnished and Contractor furnished equipment all valves, piping, piping accessories, traps, pressure reducing valves, gauges, relief valves, vents, drains, insulation, sheet metal work, controls, dampers, as required.

C. Refer to manufacturer’s drawings and specifications for requirements of medical equipment, laboratory equipment and special equipment. Verify connection requirements before bidding and confirm prior to roughing.

3.21 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary mechanical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing mechanical facilities or services.

3.22 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owner's designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed. Prior to acceptance repeat the instructions. If asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer's certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e. adjustable speed drive and air handling unit) both manufacturers shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up, including problems that occurred and their method of resolution.

C. Refer to Section 017500 - Starting and Adjusting and Section 017700 – Closeout Procedures for additional requirements.

3.23 OPERATION AND MAINTENANCE MANUALS

A. In addition to requirements stated elsewhere in these specifications, provide Operating and Maintenance manual(s) which include the following:

1. Approved Submittal documentation for all equipment stating size and selected options for each piece of equipment requiring maintenance.

2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance (excepting equipment not furnished as part of this project). Routine maintenance actions shall be clearly identified. The data shall include internal wiring diagrams and spare parts lists.

3. Name and address of each equipment supplier and at least one service agency for each piece of equipment.

4. HVAC and service water controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings and at control devices or, for digital control systems, in programming instructions.

5. A narrative of how each system is intended to operate, including recommended setpoints. Include emergency operating instructions, seasonal changeover, freeze protection and precautions necessary for Owner operations of systems.

6. As-built drawings for the project (see Record Documents) and piping diagrams.

B. Bind above items in a three ring binder with name of project on the cover. Deliver to Owner's Representative before request for acceptance. Provide copy of O&M Manual in electronic format on CD or other media format acceptable to the Owner. All documents shall be in PDF format, with the exception of record drawings which shall be provided in AutoCAD compatible drawing format.

3.24 RECORD DOCUMENTS

A. In addition to all requirements elsewhere in the Contract Documents, prepare and provide record documents of the as-constructed work which meets the following minimum standards:

1. Utilities below floors, slabs and grade: During construction, maintain accurate records of all final locations and inverts for all services inside and outside of the buildings, beneath grade and below floors.

2. Ductwork and Piping:

a. All ductwork and piping shall be clearly dimensioned with its outside dimensions (diameter or length X width) at each unique section/piece.

b. Elevations of all ductwork and piping shall be clearly identified. Elevation should be taken in respect to the finish floor and bottom of ductwork or pipe.

c. X/Y dimensions should be included for all ductwork and piping to provide precise location from a fixed bench-mark such as the corner of a building, column, etc., and neatly and clearly indicate same on reproducible prints.

3. Provide Record Drawings for all Contract Work. Document the location of control devices isolation valves, safety devices and equipment.

4. Incorporate all field changes, change orders and other modifications into the final Record Drawings.

5. Record drawings shall contain all corrections from construction documents to as-built conditions and shall be submitted for review and approval.

6. Drawing format:

a. Documents shall be provided in PDF format or, where fully developed in CAD, in AutoCAD compatible file format. Submittal media shall be as acceptable to the Owner and Engineer.

b. Drawing scale shall not be less than 3/8" = 1'-0".

c. Marked up PDFs of the contract documents will not be acceptable.

3.25 SALVAGEABLE MATERIALS

A. Salvageable materials will be reviewed and identified by the Owner. Instruction shall be given to the Contractor whether the Owner will remove salvageable materials, or whether contractor is to remove and deliver salvageable materials to a pre-designated site.

B. HVAC items normally accepted as salvage by the Owner:

1. Temperature control and automation hardware

END OF SECTION 230010

SECTION 230130 - MECHANICAL CLEANING OF HVAC SYSTEMS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

B. The cleaning work for this project includes the complete ventilation duct work, including, but not limited to the following components:

1. Ductwork
2. Heating coils
3. Registers, Grilles and Diffusers
4. Volume dampers

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

1.3 QUALITY ASSURANCE

A. Ductwork shall be cleaned in compliance with latest edition of the following standards:

1. Mechanical cleaning of non-porous air conveyance system components, NADCA ACR 2015.
2. Plans and Specifications which exceed the requirements in any of the referenced standards.

B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of Work. The Duct Cleaning Contractor or subcontractor shall be a member of the National Air Duct Cleaners Association (NADCA) and shall have at least one year of experience in this field. The Contractor shall produce a reference list to the Owner and Project Engineer of projects successfully completed of a similar size and scope.

1.4 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Shop drawings locating all proposed duct penetrations and ceiling access holes in plaster ceilings.

B. Provide MSDS sheets on all solvents, cleaners and disinfectants to be used on project.

2.0 PART 2 - PRODUCTS

2.1 DUCT DISINFECTANT

A. Equal to madacide as supplied by Mateson Chemical, EnviroCon as manufactured by Bio-Cide International, Inc., or approved equal.

2.2 SANITIZER

A. An E.P.A. registered sanitizer "Oxine" as manufactured by Bio-Cide International or approved equal. Product shall be a mixture of Oxychloride Compounds.

2.3 ENCAPSULANT

A. A duct liner adhesive coating, Foster 40-10 or 40-23, as manufactured by Foster Products Corporation, Cover-Al as manufactured by Mateson Chemical Corporation, or approved equal shall be used. It shall be a quick setting waterbase adhesive and coating designed for field application to faced or unfaced fiberglass duct liner insulation, or to unfaced fiberboard ductboard insulation. The coating shall dry to form an effective air erosion preventive coating, sealing and reinforcing the surface. The coating shall be resistant to fire, water, oil, grease, bacteria and fungus.

2.4 COATING

A. A mechanical insulation repair coating, Tough Coat, as manufactured by Vac System Industries, Inc., or approved equal shall be used. The coating material shall contain an anti-microbial agent, shall not affect the thermal or acoustic properties of the insulation, and shall conform to NYS Mechanical Code.

2.5 PLENUM PAINT

A. Porous Surface: The paint shall be Porta-Sept as manufactured by Porter Paints, Inc., or approved equal. Paint shall contain an EPA registered anti-microbial, Intercept, which inhibits the growth of bacteria, mold, mildew and fungi.

B. Non-Porous Surface: The coating shall be Tough-Coat as manufactured by VAC Systems Industries or approved equal. Coating shall meet NYS Mechanical Code and contain an anti-microbial agent.

3.0 PART 3 - EXECUTION

3.1 PRE-CLEANING PREPARATIONS

A. Prior to start of work, the HVAC system is to be carefully inspected and checked for all conditions affecting the cleaning. Defects are to be reported in writing to the Project Engineer and work will not proceed until all defects have been documented. Commencement of work will constitute acceptance of the conditions of the area to which the cleaning work is to be performed and all defects in work resulting from such accepted service will be corrected by this trade without additional expense to the Owner. No cleaning is to be performed to ducts where the process has the capability of damaging the duct lining. The decision to clean and/or encapsulate these areas will be made by the Project Engineer after review of the Contractor's findings and the Project Engineer has seen the field conditions.

B. Disassemble all removable items as required for access to work area. Store the removables in a Project Engineer approved storage area until the completion of the cleaning work.

C. Fire protection devices (such as smoke detectors, panel, etc.) shall be protected prior to cleaning procedures. They are to be cleaned and tested at the conclusion of work.

D. The Contractor shall coordinate the shutdown and reactivating of the fire alarm system to avoid accidental alarms during the cleaning process and related work.

E. The Contractor shall coordinate the shutdown of the air handling equipment with the Owner before starting work, and shall conform to OSHA requirements regarding fan motor disconnect lock-out/tag-out.

F. The Contractor shall have samples collected by gathering the gross debris from the surface of the duct at a minimum of three (3) locations per system prior to and after cleaning. This shall be accomplished by utilizing protective clean surgical gloves to handle the surface debris. A 100 cm^2 area shall be scraped and the debris placed in a 4 oz. sterile container with screw cap. The container shall be adequately marked as to sample location, date, and time as a minimum. The NADCA vacuum test is also an accepted method to attain a sample. The total weight will be established per 100 cm^2 of surface area.

3.2 GENERAL REQUIREMENTS

A. Containment. Debris removed during cleaning shall be collected and precautions must be taken to ensure that debris is not otherwise dispersed outside the ACS during the cleaning process. After ACS cleaning, any areas which could be affected by the cleaning contractor's work must be as clean as their condition prior to the commencement of the cleaning operation.

B. Particulate Collection. Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size particles shall be used (See EPA's Building Air Quality). When the Particulate Collection Equipment is exhausting outside the building, Mechanical cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to control debris removed from the ductwork or ceiling plenum. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to ensure that exhausted air does not re-enter the building.

C. Filtration Integrity. When using Particulate Collection Equipment exhausting inside the building, contractors shall be able to certify equipment effectiveness of 99.97% collection efficiency for 0.3-micron size particles through DOP test results, from an independent testing agency, for any collection device intended for use on a particular job.

D. Controlling Odors. All reasonable measures shall be taken to control offensive odors and/or mist vapors during the cleaning process.

E. Component Cleaning. Cleaning methods shall be employed such that all Non-Porous surface components must be Visibly Clean. Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

F. Air-Volume Control Devices. Dampers and any air-directional mechanical devices inside the ductwork must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

G. Access Holes. Any access holes cut for the cleaning process must be repaired so that they shall not significantly alter the airflow. All openings made to facilitate the cleaning must be sealed in accordance with industry standards and local codes, using materials acceptable, under those standards and codes. (See Specification Section 233000 and SMACNA's HVAC Duct Construction Standards - Metal and Flexible, 2005).

1. Access doors in ductwork shall be a minimum size of 16 x 12 and installed in locations as shown on drawings. All other openings required by the contractor to properly clean the ductwork may be access holes patched as per the contract documents.

2. Patch all access holes to match existing duct material. Patches shall be installed in a manner to maintain duct pressure class. Sealant shall be applied to mitigate any duct leakage.

3.3 HEALTH AND SAFETY

A. Cleaning contractors shall comply with all applicable federal, state and local requirements for protecting the safety of the contractors' employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) should be followed when working in accordance with this standard.

B. No processes or materials shall be employed in such a manner that they will create adverse health effects to the building occupants, cleaning contractors, or general public.

C. Disposal of Debris. All debris removed from the ACS shall be disposed of in accordance with all applicable federal, state and local requirements.

3.4 MECHANICAL CLEANING

A. Interior Duct Surfaces:

1. The interior of all ducts shall be brushed and mechanically vacuumed such that all metal surfaces are visibly clean and capable of Non-Porous Surfaces Cleaning Verification as described in the NADCA Standards. No cleaning method should be used which could potentially damage components of the ductwork or negatively alter the integrity of the system.

3.5 VERIFICATION

A. General. Verification of cleanliness will be determined after Mechanical Cleaning and before the application of any treatment or introduction of any treatment-related substance. Verification of Non-Porous Surface Cleaning and Verification of Coil Cleaning shall be conducted after Mechanical Cleaning and before the system is restored to normal operation.

B. Verification of Non-Porous Surface Cleaning:

1. All Non-Porous Interior Duct/Air Handling Unit Surfaces must be Visibly Clean and capable of passing the NADCA Vacuum Test.

2. The weight of Debris collected by the NADCA Vacuum test, as outlined in Appendix A of the NADCA Standards, shall not exceed 1.0 mg/100cm^2.

3. The Contractor shall include in the bid the cost for four independent vacuum tests to be performed at the time and location as directed by the Engineer. If any areas fail, the entire system shall be recleaned and retested at no cost to the Owner.

3.6 SEQUENCE OF WORK

A. Since the systems must be operational during the normal work hours unless coordinated in advance with the Owner and occupants. The Contractor shall submit to the Owner a procedure for cleaning the ductwork and installing filters which will minimize contamination of already cleaned areas. This sequence must be approved by the Owner and Project Engineer prior to starting work.

3.7 SANITIZATION

A. A sanitizing agent shall be applied to all supply and return air metal only ductwork cleaned as part of this project. Application and preparation shall be as per manufacturer's recommendations.

B. The Contractor must demonstrate to the Project Engineer how the application method is capable of dispensing the sanitizing solution to the entire surface areas of the ductwork.

3.8 REPORT

A. The Contractor will submit three (3) copies of the final report to the Project Engineer outlining the conditions and work completed on each HVAC system.

B. The report shall contain a tabulation of the vacuum test taken before and after the cleaning process.

C. The report shall contain the findings of tests performed on the air quality (i.e. presence of CO_2 VOC, etc.).

D. The report shall contain the findings of tests performed on the debris collected with the ACS (i.e. the composition of the material).

E. The report shall contain photographic or video documentation of representative areas of the ductwork systems cleaned as part of the project. This photo documentation shall show both before and after pictures verifying visual inspection.

END OF SECTION 230130

SECTION 230509 - ROOF CURBS AND EQUIPMENT SUPPORTS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation of roof curbs, as shown in the Contract Documents. This section applies to equipment used to support mechanical system components and is inclusive of curbs, equipment supports, support stands and penetration housings.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This contractor shall coordinate all final rail selections, including anchoring details to both equipment and building roof deck, with the requirements of specification Section 230550 (Wind Restraint for HVAC Systems). Final determinations as provided by the Engineer of Record for the seismic and/or wind restraint calculations shall override any similar information provided within these specifications and the project drawings.

1.3 SUBMITTALS

A. Typical detail and schedule for equipment used to support mechanical system components shall include cross-sectional view illustrating clearly the type of curb being submitted, i.e. double wall insulated, with or without cant.

2.0 PART 2 – PRODUCTS

2.1 ROOF CURBS

A. Curb constructed of galvanized steel, with continuous welded corner seams and painted at all welds. 20 gauge up to 36”., 18 gauge 38 to 72”., 16 gauge over 72” in any dimension. Double wall with liner and 1-1/2” minimum thickness 3# density fiberglass insulation. All fans to have minimum 18" high curbs. Curb heights to be adjusted based on field verification of roofing system such that exhaust / relief outlets are no less than 18” above the membrane surface, and intakes no less than 24”. Provide curb with gasket on top to make airtight seal between curb and ventilator, fan, or air handling unit. Curb provided with raised cant, flanged or recessed to coordinate with roofing type. Curb flange shall suit roof construction, wind restraint requirements and type of insulation being applied.

B. Design Equipment: RPS Model RC Series.

C. Acceptable Make: Pate, Shipman & Son, RPS.

2.2 EQUIPMENT SUPPORTS

A. Double wall, 2 in. x 8 in. wood blocking, minimum 18” high. Rail heights to be adjusted based on field verification of roofing system such that top of rail is no less than 12” above the membrane surface. Fully insulated in the interior cavity with rigid insulation on supports which are 10” or wider. Constructed of 18 gauge galvanized steel with continuous welded corner seams and painted at all welds. 1 ½” minimum thickness 3# density fiberglass insulation. Constructed of heavier gauge steel where standard curb cannot support unit weight. Provide with top cap counter flashing. Support provided with raised cant, flanged or recessed to coordinate with roofing type. Support flange shall suit roof construction, wind restraint requirements and type of insulation being applied.

B. Design Equipment: RPS Model ER-2A.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

2.3 PIPE SUPPORTS ASSEMBLY

A. Same construction as "Equipment Supports." Provide with full length steel bracket, U-bolts and accessories as required to secure piping to the pipe support as detailed on Contract Drawings.

B. Design Equipment: RPS Model ER-2A.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

2.4 PIPE CURB ASSEMBLY

A. 2” x 2” continuous cap blocking, fully insulated with rigid 1-1/2" 3# density insulation. Minimum 18” high. Constructed of 18 gauge galvanized steel with welded at all contact points. Painted at all welds. Acrylic coated, ABS rib reinforced curb cover and integral counter flashing, size and number of pipe and conduit openings as required to suit job conditions. EPDM protective rubber pipe boots and stainless steel clamps secured around each pipe individually. Curb provided with raised cant, flanged or recessed. Curb flange shall suit roof construction and type of insulation being applied.

B. Design Equipment: RPS N Series with RC Series curb system.

C. Acceptable Makes: Pate, Shipman & Son, RPS.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Height as recommended by equipment manufacturer, not less than described in Part 2.0. This Contractor shall be responsible for exact size, length, and location and shall set and secure each curb to roof. Shim and level curb as required. Provide curb and supports for all roof-mounted equipment. All roof penetrations shall be made through an appropriate curb. All roof-mounted equipment including fans, air handling units, etc., shall be set on an equipment support unless otherwise noted. Refer to Contract Drawings for details on plenums extending from curbs.

END OF SECTION 230509

SECTION 230513 – MOTORS

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit motor information with submittal for equipment served, when applicable. Motor submittal shall include manufacturer's name and model number, motor type, motor characteristics including voltage, phase, horsepower, and speed.

1.3 RELATED SECTIONS

A. Section 262923 – Adjustable Speed Drives

2.0 PART 2 – PRODUCTS

2.1 MOTORS

A. General Requirements:

1. Motors built for 60 Hz operation, three phase for 1/2 hp and larger; single phase for 1/3 hp and smaller. In compliance with NEMA Standards, wound specifically for nameplate voltage, and selected for appropriate duty and environment. Minimum service factor of 1.15 at rated voltage and frequency. Bearings ABMA L10 rated for 5 years continuous, non-severe duty. V-belt connected motors with adjustable slide rail bases and pulleys. Motors shall have Class F insulation system, with Class B temperature rise. Maximum allowable motor temperature rise for open drip-proof or totally enclosed fan cooled (TEFC) type at 1.15 service factor shall be 80°C above 40°C ambient up to 300 hp. NEMA locked rotor KVA code as required to match unit equipment torque characteristics. Single-phase motors shall be capacitor start, induction run, or split phase type. Polyphase motors shall be constant speed, squirrel cage, unless otherwise called for.

2. Fractional HP Fan Motors between 1/12 and 1 hp shall be electronically commutated motors or have a minimum motor efficiency of 70%, rated in accordance with DOE 10 CFR 431. Motors shall be provided with local motor speed adjustment for balancing and / or remote control capability as required by the sequences of operation. The use of belt driven fans to sheave adjustments for air flow balancing in lieu of varying motor speed is permitted only where direct drive equipment is not specifically called out as design basis.

a. Exceptions:

1) Motors in the air stream of fan coils and terminal units that only provide heating to the space served.

2) Motors in systems which meet the efficiency ratings in part 403 of the IECC while accounting for motor power in the efficiency calculations.

3. Three Phase Motors rated 1 hp and greater shall meet the following nominal efficiency ratings:

a. Minimum Nominal Full-Load Efficiency for 60 Hz NEMA General Purpose Electric Motors (Subtype I) rated 600 Volts or less (Random Wound)

Motor Horsepower	Number of Poles	Open Drip Proof Motors			Totally Enclosed Fan Cooled Motors		
		2	4	6	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200	3600	1800	1200
1		77.0	85.5	82.5	77.0	85.5	82.5
1.5		84.0	86.5	86.5	84.0	86.5	87.5
2		85.5	86.5	87.5	85.5	86.5	88.5
3		85.5	89.5	88.5	86.5	89.5	89.5
5		86.5	89.5	89.5	88.5	89.5	89.5
7.5		88.5	91.0	90.2	89.5	91.7	91.0
10		89.5	91.7	91.7	90.2	91.7	91.0
15		90.2	93.0	91.7	91.0	92.4	91.7
20		91.0	93.0	92.4	91.0	93.0	91.7
25		91.7	93.6	93.0	91.7	93.6	93.0
30		91.7	94.1	93.6	91.7	93.6	93.0
40		92.4	94.1	94.1	92.4	94.1	94.1
50		93.0	94.5	94.1	93.0	94.5	94.1
60		93.6	95.0	94.5	93.6	95.0	94.5
75		93.6	95.0	94.5	93.6	95.4	94.5
100		93.6	95.4	95.0	94.1	95.4	95.0

125		94.1	95.4	95.0	95.0	95.4	95.0
150		94.1	95.8	95.4	95.0	95.8	95.8
200		95.0	95.8	95.4	95.4	96.2	95.8
250		95.0	95.8	95.4	95.8	96.2	95.8
300		95.4	95.8	95.4	95.8	96.2	95.8
350		95.4	95.8	95.4	95.8	96.2	95.8
400		95.8	95.8	95.8	95.8	96.2	95.8
450		95.8	96.2	96.2	95.8	96.2	95.8
500		95.8	96.2	96.2	95.8	96.2	95.8

Note: Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

b. Minimum Average Full Load Efficiency Polyphase Small Electric Motors:

Motor Horsepower	Open Motors			
	Number of Poles	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200
0.25		65.6	69.5	67.5
0.33		69.5	73.4	71.4
0.50		73.4	78.2	75.3
0.75		76.8	81.1	81.7
1		77.0	83.5	83.8
1.5		84.0	86.5	83.8
2		85.5	86.5	N/A
3		85.5	86.9	N/A

c. Minimum Average Full Load Efficiency for Capacitor-Start Capacitor-Run and Capacitor-Start Induction-run Small Electrical Motors

Motor Horsepower	Open Motors			
	Number of Poles	2	4	6
	Synchronous Speed (RPM)	3600	1800	1200
0.25		66.6	68.5	62.2
0.33		70.5	72.4	66.6
0.50		72.4	76.2	76.2
0.75		76.2	81.8	80.2
1		80.4	82.6	81.1
1.5		81.5	83.8	N/A
2		82.9	84.5	N/A
3		84.1	N/A	N/A

d. Minimum Nominal Full-Load Efficiency of General Purpose Electric Motors (Subtype II) and all Design B Motors Greater than 200 Horsepower

Motor Horsepower	Number of Poles	Open Drip Proof Motors				Totally Enclosed Fan Cooled Motors			
		2	4	6	8	2	4	6	8
	Synchronous Speed (RPM)	3600	1800	1200	900	3600	1800	1200	900
1		NR	82.5	80.0	74.0	75.5	82.5	80.0	74.0
1.5		82.5	84.0	84.0	75.5	82.5	84.0	85.5	77.0
2		84.0	94.0	85.5	85.5	84.0	84.0	86.5	82.5
3		84.0	86.5	86.5	86.5	85.5	87.5	87.5	84.0
5		85.5	87.5	87.5	87.5	87.5	87.5	87.5	84.0
7.5		87.5	88.5	88.5	88.5	88.5	89.5	89.5	85.5
10		88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5

15		89.5	91.0	90.2	89.5	90.2	91.0	90.2	88.5
20		90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5
25		91.0	91.7	91.7	90.2	91.0	92.4	91.7	89.5
30		91.0	92.4	9.4	91.0	91.0	92.4	91.7	91.0
40		91.7	93.0	93.0	91.0	91.7	93.0	93.0	91.0
50		92.4	93.0	93.0	91.7	92.4	93.0	93.0	91.7
60		93.0	93.6	93.6	92.4	93.0	93.6	93.6	91.7
75		93.0	94.1	93.6	93.6	93.0	94.1	93.6	93.0
100		93.0	94.1	94.1	93.6	93.6	94.5	94.1	93.0
125		93.6	94.5	94.1	93.6	94.5	94.5	94.1	93.6
150		93.6	95.0	94.5	93.6	94.5	95.0	95.0	93.6
200		94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
250		94.5	95.4	95.4	94.5	95.4	95.0	95.0	94.5
300		95.0	95.4	95.4	NR	95.4	95.4	95.0	NR
350		95.0	95.4	95.4	NR	95.4	95.4	95.0	NR
400		95.4	95.4	NR	NR	95.4	95.4	NR	NR
450		95.8	95.8	NR	NR	95.4	95.4	NR	NR
500		95.8	95.8	NR	NR	95.4	95.8	NR	NR

Note: Nominal efficiencies shall be established in accordance with DOE 10 CFR 431.

4. Nominal Motor Voltage Table:

Nominal System Voltage	Motor Nameplate
480V - 3 phase	460 volt
240V - 1 phase and 3 phase	230 volt
208V - 1 phase and 3 phase	200 volt
120V - 1 phase	115 volt

5. Motor Application:

Environment/Location	Motor Enclosure Type
General Purpose	Open drip-proof, TEFC, or encapsulated
Outdoors, below grade or high humidity	TEFC
Hazardous	Explosion-proof
Packaged Refrigeration Compressors	Hermetic or semi-hermetic

6. Make: Need not be all of same make, but one of the following: General Electric, Gould, Reliance, Westinghouse, Marathon, Baldor.

2.2 SHAFT GROUNDING RINGS

A. Motors for Use with Adjustable Speed Drives:

1. All motors with Adjustable Speed Drives, whether factory provided or field applied, shall be equipped with shaft grounding rings.

2. Shaft Grounding Ring on NEMA Premium® and inverter duty motors consisting of conductive microfibers and grounding path.

B. Shaft Grounding Kit for Field Installation

1. Field applied shaft grounding ring for motors controlled by adjustable speed drives designed to be installed by contractor.

3.0 PART 3 – EXECUTION

3.1 MOTORS

A. Furnished by equipment manufacturer and especially manufactured and/or selected, mounted, and installed for intended use. Install motors accessible for maintenance and belt adjustment.

3.2 REPLACEMENT OF EXISTING MOTORS

A. Field verify existing motor characteristics and provide motors as called for. Modify or replace existing motor mounts and bases to accommodate the replacement motors. Replace drive and driven sheaves and provide a heavy duty belt set.

3.3 SHAFT GROUNDING RINGS

A. Motors: Wire Shaft Ground Kit on motors for use with Adjustable Speed Drives

1. Ensure shaft grounding kit is installed on motor accordance with manufacturer's recommendation.

2. Shaft grounding ring (SGR) is bolted directly to the motor end bracket or installed with conductive epoxy to ensure ground connection from the SGR to motor frame.

END OF SECTION 230513

SECTION 230514 - ELECTRIC WIRING

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services for the complete installation of motor control, equipment manufacturer remote device and temperature control wiring as required for a fully functional system. Provide interlock wiring from safety devices (freezestats, flow switches, etc.) to control panels. Provide wiring and conduit required to connect devices furnished as part of or adjunctive to the automatic temperature control system and for motor control regardless of the source of supply. Control wiring includes 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 120 volt maximum. Provide devices required for proper system operation, including special electrical switches, transformers, disconnect switches, relays, and circuit breaker protection.

B. Coordinate all work with Division 26, "Electrical".

1.2 RELATED SECTIONS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This Section applies to all work provided under division 23.

1.3 WORK NOT INCLUDED

A. Power wiring for motors, motor starters and associated starting and control equipment, as well as the motor starters (except in the case of equipment specified to have packaged controls/starters), are included in Division 26, "Electrical," unless otherwise called for.

1.4 QUALIFICATIONS

A. Wiring installed in compliance with all requirements of Division 26, "Electrical" and the National Electric Code.

1.5 SUBMITTALS

A. Provide submittals including complete wiring diagrams for equipment and systems. Deliver wiring diagrams to proper trades in time for roughing of conduit, equipment connections, and to avoid delay in construction schedule. Wiring diagrams and roughing information shall clearly indicate scope of work that is part of the Work of Division 26, "Electrical".

2.0 PART 2 – PRODUCTS

2.1 PRODUCTS

A. Refer to Division 26 specifications for required wiring materials.

B. All wiring system materials within plenums shall be non-combustible or shall be listed and labeled as having a flame spread index not more than 25 and a smoke developed index of not more than 50 when tested in accordance with ASTM E84 or UL 723. These requirements include control system components and all associated components. All electrical and control components not conforming to these requirements must be fully contained in a non-combustible enclosure or raceway unless listed and labeled for such use under UL 2043.

C. Combustible electrical wires and cables and fiber-optic cables exposed within a plenum shall be listed as having a peak maximum optical density of 0.50 or less and an average optical density of 0.15 or less, and a maximum flame spread distance of 5 ft. or less when tested in accordance with NFPA 262 or shall be installed in metal raceways or sheathed cable. Combustible optical fiber and communication raceways exposed within a plenum shall be listed to the same maximum and average optical densities and flame spread distance under ANSI/UL 2024. Only plenum rated wires and cables shall be installed in plenum rated raceways.

3.0 PART 3 – EXECUTION

3.1 GENERAL

A. Check electrical wiring pertaining to equipment for completeness and correctness of connections. Correct any misapplied motor and/or motor starter, improper thermal overload device, or device which fails to function and resultant damage, whether due to incorrect connections or improper information on wiring diagrams.

B. All wiring which passes through an enclosure, wall stud, framing, or other material where abrasion to the wiring system is a long term risk shall be protected using bushing inserts. Electrical tape or other removal media is not considered proper protection against abrasion.

C. Final connections to equipment shall be provided with using flexible whips no longer than 18 inches in length terminated using appropriate connectors.

D. Conduits mounted directly to the outside of insulated plenums, equipment or ductwork shall be installed using appropriate standoff's to avoid compressing the insulation and reducing the value. Repair all insulation damaged during conduit and wiring system installation.

E. Wiring shall be appropriately trimmed and terminated at all equipment. Bundled excess wiring "loops" will not be permitted.

3.2 WIRING FOR CONTROL SYSTEMS

A. Provide motor control, temperature control, interlock, safety device and instrumentation wiring for equipment. All wiring shall be in conduit, unless otherwise noted. All control wiring shall be installed in blue colored conduit and associated accessories. Refer to Division 26 for type of conduit to be used in specific applications. Provide 18 in. long flexible conduit at motors and devices subject to vibration. Conduit shall be supported on 5 ft. centers. Do not attach directly to hot surfaces, piping, or ductwork. Control wiring shall be in separate conduit from all other wiring. Provide green grounding wire circuited from starter, and run ground wire through conduit to each remote auxiliary relay, pushbutton station, remote panel heating device, thermostat, or device with potentials in excess of 50 volts. Size ground wire as required by NEC.

B. Provide pushbutton stations, pilot lights, selector switches, auxiliary starter contacts, and other devices required to provide specified functions.

C. Where allowable by Code and contract documents, temperature control wiring may be installed without conduit. Installation and wire insulation types shall be as described by NEC, Article 725. All low voltage wiring circuits 50V and under shall:

1. When installed horizontally above accessible ceilings low voltage wiring may be run without conduit. Cables shall be supported using bridle rings attached to building structure. Wherever possible, wiring shall be bundled to avoid clutter in the ceiling cavity, and wiring runs shall be provided parallel and perpendicular to building lines.

2. All exposed wiring in occupied spaces shall be run in surface metal raceway, wiremold v700 series where no access is available to wall cavity.

3. In locations where control wiring is being run to wall mounted sensors, the conduit within the stud wall, as well as the junction box, shall be of non-metallic construction. Carlon Flex-Plus Blue Electrical Non-metallic Tubing and Accessories, or equal.

4. All cases not specifically covered by the above cases shall be run in conduit.

3.3 EQUIPMENT WIRING

A. Provide power and control wiring between sections of electric radiation units, between shipping splits, and between remote panels, thermostats, disconnect switches, and their respective units. Provide control wiring from the package control system, to each respective electric heat coil, reheat coil or motor. Properly mount control package. Power wiring to and including disconnect switch shall be by Division 26 "Electrical".

3.4 FIELD WIRING IN STARTERS, CONTROLLERS, AND PANELS

A. Wiring within starters, controllers, and temperature control panels, shall be routed neatly in gutter space, away from moving and/or heat producing parts. Provide 30 ampere, 600 volt rated terminal blocks. Do not place more than two wire connections on pilot device or relay terminal. Where more than two circuit connections are required, use terminal blocks. Provide nylon self-insulated, locking type spade lugs for all control wires. Cables and wires shall be neatly bundled and lashed with nylon cable straps. All wiring installed in a single enclosure shall be rated for the maximum voltage in said enclosure or physical separation provided in compliance with the NEC.

END OF SECTION 230514

SECTION 230519 - GAUGES AND THERMOMETERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit manufacturer's data for each gauge and thermometer type. Submittal shall clearly designate where each device shall be utilized, including the scale range.

2.0 PART 2 - PRODUCTS

2.1 WATER PRESSURE GAUGES

A. Construction shall be Bourdon tube type; 4-1/2 in. diameter minimum dial face, in stainless steel case and plastic lens. Phosphor bronze tube, phosphor bronze bushed rotary movement, silver brazed or soldered to brass socket and brass tip, 1/4 in. bottom connection. Accuracy, one (1.0) percent of included scale range. White dial face with black numerals, graduated in pounds per square inch (psi); equipped with bronze adjustable pressure snubber and ball valve. Ball valve shall meet the requirements of Specification Section 230523 for the system it is serving.

B. Make: American, Ashcroft, Crosby, Duro, Marsh, Moeller, Trerice, Weiss, Weksler.

2.2 PIPING SYSTEM THERMOMETERS

A. Vertical liquid filled type - Industrial type, black molded ABS case with plastic front, mercury free blue reading column, V-shaped aluminum scale, black numerals. Union flange mounted, separable socket, extension necks where required; range as called for based on service. Universal adjustable type, 9 in. scale size. For installation in water systems where the maximum temperature is less than 120°F: graduations of 1°F, accurate to within 1°F. For installation in hot water systems: graduations of 2°F, accurate to within 2°F.

1. Make: American, Moeller, Trerice, Weiss, Weksler.

2.3 SOLAR POWERED THERMOMETERS FOR PIPE AND DUCT

A. NEMA 4X case tested in compliance with SAE J2527

B. Stem configured for use with pipe well or air duct.

C. Glass encapsulated thermistor sensing element

D. Accuracy 1% of scale or 1°F, whichever is greater

E. Resolution 0.1°F

F. Ambient conditions -40 – 140°F, max 95% non-condensing

G. Update interval 10 seconds

H. Built in min / max recall function

I. Will operate in ambient lighting down to 10 lux levels

J. Available with 2 ½ - 12 inch stem lengths.

K. Available with either aluminum or bimetal / stainless steel stem.

L. Design Make: Trerice SX9

2.4 DUCT MOUNTED THERMOMETERS [Designer note: Designate locations for duct mounted thermometers on drawings. Delete section if not required.]

A. Nine inch scale, blue reading (mercury free) type, with fiberglass polyester (GE Valox) case, adjustable Vari-angle stem with a 9" end perforated sensing tube and duct flange.

B. Heating and/or ventilating unit thermometers: graduated from 0° to 160°F with 2° divisions.

C. Air conditioning unit thermometers: graduated from 0°to 120°F with 1° divisions.

D. Make: Weiss Model 9VD9 or approved equal.

2.5 PRESSURE/TEMPERATURE TEST PLUGS

A. 1/4 in. NPT plug shall be capable of receiving either a pressure or temperature 1/8 in. o.d. probe. Dual seal core of Nordel 275ºF with zero leakage from vacuum to 500 psig.

B. Makes: Peterson Equipment Company, Sisco P/T plugs.

3.0 PART 3 - EXECUTION

3.1 WATER PRESSURE GAUGES

A. Provide ball valve on each gauge line meet the requirements of Specification Section 230523.

B. Provide water pressure gauge in piping systems where called for and where scheduled below: [Designer note – edit gage ranges to be appropriate for system. Select range such that anticipated normal operation near mid-point of scale]

1. Provide ball valve in each pump inlet and outlet tapping, or in piping adjacent to same. Range: 30 in. vacuum to 100 psi.

2. Each water make-up valve assembly: 0 to 60 psi range.

C. Select gauges from manufacturer's standard equipment such that anticipated measurements will reside generally in the middle third of the instrument's range.

3.2 PIPING THERMOMETERS

A. Mounted in oversize tee or elbow if necessary, to provide as little restriction as possible to fluid flow and maintain sensing bulb fully in measured media, with stems of proper length to allow accurate reading. Locate adjacent to control sensing equipment. Arrange so as to be easily read from floor.

B. Provide in piping systems where called for and where scheduled below: [Designer note – edit thermometer ranges to match such that expected measured temperature is near mid-range. Not required for SX9 type.]

C. Select thermometers from manufacturer's standard equipment such that anticipated measurements will reside generally in the middle third of the instrument's range.

3.3 DUCT MOUNTED THERMOMETERS [Designer note - coordinate with 2.4 above or delete if not used.]

A. Locate each thermometer for easy reading from floor or catwalk level.

B. Provide at all air handling units in the discharge airstream downstream of the supply fan indicating supply air temperature; in the mixed air stream in the mixed air plenum indicating mixed air temperature; and/or in those locations designated on the drawings; temperature gauges mounted in the unit control panel face is an acceptable alternate.

3.4 TEST PLUGS

A. Provide test plugs at gauge and thermometer locations as called for.

END OF SECTION 230519

SECTION 230523 – VALVES

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment, and services as required for the complete installation and related work designated in contract documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Valves and accessories.

2.0 PART 2 – PRODUCTS

2.1 VALVES:

A. General: Valves shall meet the following requirements:

1. Working pressure shall be stamped or cast on bodies.

2. Stem packing shall be serviceable without removing valve from line.

3. To establish a standard of quality and identify features, certain manufacturer's numbers are given in the following paragraphs.

B. Swing Check Valves – HVAC Systems (Non-Potable Water Systems):

1. **CV-01 -** Bronze 2" and Under (Threaded and Soldered End Connections):

a. Valves shall be suitable for 125 SWP/200WOG, 150 SWP/300 WOG or 300 SWP/ 1000WOG, renewable disc, T-Pattern or Y-Pattern.

b. Body and Cap: Bronze ASTM B62.

c. Lever: Stainless steel or brass.

d. Disc: Bronze ASTM B16, ASTM B453, or ASTM B61.

e. Acceptable Makes: Milwaukee 509/1509 (Class 125), 515/1515 (Class 150) or 507 (Class 300); Hammond IB904//IB912 (Class 125), IB515Y (Class 150) or IB949 (Class 300); Crane 37/ (Class 125), 137 (Class 150) or 36E (Class 300); Nibco T-413/S-413 (Class 125), T-433/S-433 (Class 150) or T-473 (Class 300); Apollo 161T (Class 125), 164T (Class 150).

2. **CV-03 -** Cast Iron 2 ½" and Larger (Flanged End Connection):

   a. Valves shall be Class 125 or Class 250, bolted cap.

   b. Body and Bonnet: Cast iron ASTM A126, Class B.

   c. Seat Ring: Bronze ASTM B62

   d. Disc: Cast iron ASTM A126, Class B or cast bronze ASTM B62

   e. Hinge: Ductile iron ASTM A536 or cast bronze ASTM B62.

   f. Acceptable Makes: Milwaukee F-2974A (Class 125) or F-2970-M (Class 250); Crane 373 (Class 125) or 39E (Class 250); Powell Figure 559 (Class 125); Lunkenheimer Figure 1790 IBBM (Class 125); Nibco F-918-B (Class 125) or F-968-B (Class 250).

C. Silent Check Valves – HVAC Systems (Non-Potable Water Systems):

1. **SCV-01** - Bronze 1½" and Under (Threaded End Connection):

   a. Valves shall be suitable for 400 psi at 150°F, globe style, two piece design, center guided disc.

   b. Body and Cap: Bronze ASTM B62 or ASTM B585.

   c. Guide Pin: Stainless steel

   d. Seat of Seal: EPDM A240 Type 304/ASTM A276 Type 410 (Class 300).

   e. Spring: Stainless steel.

   f. Acceptable Makes: Mueller 303; Apollo 61-500.

2. **SCV-02** - Cast Steel 2" and Larger (Flanged End Connection):

   a. Valves shall be Class 150 (285 psi at 100°F) or Class 300 (740 psi at 100°F), globe body design, guided disc.

   b. Body and Bonnet: Cast steel ASTM A216 WCB.

   c. Spring: Stainless steel ASTM 182, Grade F-316.

   d. Seat: Stainless steel ASTM 351, Grade CF8M.

   e. Disc: Stainless steel ASTM 351, Grade CF8M.

   f. Acceptable Makes: Mueller 105MDT (Class 150) or 109MDT (Class 300); Keckley Style CG (Class 150 and Class 300); Dezurik CSC 600A (Class 150 and Class 300).

3. **SCV-03** – Bronze 2" and Under (Threaded and Soldered End Connections):

   a. Valves shall be suitable for 400 psi at 150°F, globe style, two piece design, center guided disc.

   b. Body and Cap: Bronze ASTM B584.

   c. Tail Piece: Bronze ASTM B584

   d. Disc: TFE

   e. Spring: Bronze ASTM B103.

   f. Acceptable Makes: Milwaukee 548T/1548T.

D. Ball Valves – HVAC Systems (Non-Potable Water Systems):

1. **BV-03 -** Bronze 2" and under (Threaded and Soldered End Connections)

   a. Valve shall be suitable for 600 psi WOG non-shock, 150 psi WSP full port with blowout proof stem.

   b. Body: Bronze.

   c. Stem: 316 Stainless Steel.

   d. Ball: 316 Stainless Steel.

   e. Seats and Seals Stem Packing and Thrust Washer: PTFE.

   f. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.

   g. Adjustable stem packing.

   h. Acceptable Makes: Watts LFB6080-G2-SS (threaded) and LFB6081-G2-SS (solder); Apollo 77C-140 (threaded) and 77C-240 (solder); Milwaukee BA400S (threaded) and BA450S (solder); Nibco T-585-66 (threaded) and S-585-66 (solder); Hammond 8303A (threaded) and 8313A (solder).

2. **BV-08 -** Carbon Steel 2 1/2" to 12" (Flanged End Connection): Designer Note – Ball valves are a standard on RIT projects instead of using butterfly valves.

   a. Valve shall be Class 150 designed for 285 psi WOG non-shock, 150 psi at 365°F saturated steam or Class 300 designed for 740 psi WOG non-shock, full port, split body, raised face flange, with blowout proof stem conforming to ANSI/ASME B16.34, ANSI/ASME B16.10, ANSI/ASME B16.5, MSS SP-25 and MSS SP-72

   b. Body: ASTM A216 GR WCB Carbon Steal.

c. Stem: Stainless steel Type 316 ASTM A276.

d. Ball: Stainless steel Type 316 ASTM A276.

e. Seats and Seals Stem Packing and Thrust Washer: PTFE/RPTFE.

f. Handle: Lever for valves below 6" and gear operators for 6" through 12".

g. Adjustable stem packing (graphite).

h. Acceptable Makes: Milwaukee F20CS; Nibco F-515-CS-F-66-FS (Class 150) or F-535-CS-F-66-FS (Class 300); Jamesbury 9150 (Class 150) or 9300 (Class 300); Apollo 87A-200 Series (Class 150) or 87A-900 (Class 300); Watts G4000 and G4000M1 (Class 125)

E. Valves for Gauges and Instruments – HVAC Systems (Non-Potable Water Systems):

1. Ball valve ½" in size meeting the requirements above for the services specified.

F. Butterfly Valves – HVAC Systems (Non-Potable Water Systems):

1. **BFV-01 -** Standard Performance 2 ½" and Larger (Lugged Type Connection):

a. Valves shall be rated at 200 psi CWP (2 ½" to 12") and 150 psi CWP (14" to 24"), ASNI 125/200 flange pattern, extended neck, integral mounting pad for actuator, fully rated for dead end bidirectional service.

b. Body: Ductile Iron ASTM A536.

c. Seat: EPDM ASTM D20000

d. Shaft: Type 316 stainless steel or Type 416 stainless steel.

e. Disc: Type 316 stainless steel ASTM A351.

f. Bushing: Duralon or bronze

g. Handle: Lever for valves below 6" and gear operators for 6" and larger.

h. Acceptable Makes: Watts DBF; Crane 44; Milwaukee Series ML; Nibco LD 2022; Jenkins Series 225; Keystone Figure 322.

2. **BFV-02 -** High Performance 2 ½" and Larger (Lugged Type Connection):

a. Valves shall be Class 150 or Class 300, bi-direction bubble tight shutoff, extended neck, double offset disc, integral mounting pad for actuator,

b. Body: Carbon Steel ASTM A216 WCB.

c. Seat: RTFE.

d. Shaft: 17-4 PH ASTM A564 Condition H1075 or H1100.

e. Disc: Type 316 stainless steel ASTM A351 CF8M.

f. Shaft Packing: PTFE

g. Shaft Bearing: Type 316 stainless steel /nitride

h. Handle: Lever for valves below 6" and gear operators for 6" and larger.

i. Acceptable Makes: Keystone K-LOK Figure 362 (Class 150) or Figure 372 (Class 300); Jamesbury Series 815 (Class 150) or Series 830 (Class 300); Milwaukee Series HP (Class 150 or Class 300); Nibco LD S-6822 (Class 150) or LCS-7822 (Class 300).

G. Hose Threaded Drain and Manual Vent Valve (Non-Potable Heating Hot Water, Chilled Water, Heating Glycol and Cooling Glycol Systems Operating at a maximum pressure of 125 psi and temperature of 200°F or Below):

1. **DBV-01** - Bronze ½" and ¾" (Threaded and Soldered End Connections)

a. Valve shall be suitable for 400 psi CWP, 2-piece, full port ball valve with blowout proof stem, ¾" hose connection.

b. Body: Bronze ASTM B584 or Brass ASTM B283.

c. Stem: Brass ASTM B16, silicon bronze ASTM B371 alloy C69430 or ASTM B99 alloy C65100.

d. Ball: Chrome plated brass ASTM B16 alloy C36000, ASTM B125 alloy C37700 or ASTMB282 alloy C37700.

e. Seats and Seals Stem Packing and Thrust Washer: PTFE and RPTFE.

f. Handle: Zinc-plated carbon steel with vinyl insulator. Provide handle with extended stem on insulated piping. Provide locking lever.

g. Adjustable stem packing.

h. Acceptable Makes: Watts LFFBV-3C-CC (threaded) and LFFBVS-3C-CC (solder); Apollo 70-100-HC (threaded) and 70-200-HC (solder); Milwaukee BA100H (threaded) and BA150H (solder); Nibco T-585-70-HC (threaded) and S-585-70-HC (solder); Hammond 8501H (threaded) and 8511H (solder).

H. Balance Valve:

1. **General:**

a. Where contractor submits "termination kits" with integral balance valve for approval, use does not preclude the need to provide separate equipment isolation valve. Balance valves are not to be used for isolation duty. Provide separate isolation valve in compliance with Exhibit A of this section.

2. **GBV-01** - Globe Type Balancing Valve:

   a. Balancing valve and flow meter stations suitable for use on heating and cooling systems.

   b. Maximum Pressure Drop 5.0 Ft. or less.

   c. Calibrated balance valve with provisions for connecting a portable differential pressure meter. Meter connections to have built-in check valves.

   d. Multi-turn handle for precision adjustment.

   e. Balance valve size shall be based upon gpm range rather than pipe size. Select flow balancers such that the range of pipe flow resides in the middle 50% of the manufacturer's recommended operating range for the device.

   f. Operating temperature range -4 – 248°F. Suitable for 300psi at 150°F.

   g. Brass: Solder or threaded body to match piping system up to 2".

   h. Cast Iron: Grooved or flanged bodies to match piping system 2 ½ - 12".

   i. Acceptable Makes: Armstrong CBV; Tour & Anderson 780 Series; Griswold "Speedset"; Macon STV

3.0 PART 3 – EXECUTION

3.1 INSTALLATION

A. General:

1. Provide valves of type called for and where required to service equipment.

2. Provide at major building and system sections.

3. Isolating valves for individual fan convectors, room units, terminal units, or other similar apparatus may be inside cabinet or at connection to branch main where accessible.

4. Locate valves with stems at or above horizontal positions and swing check valves in horizontal position only.

5. Provide hose threaded drain valves at all piping system low points, strainers, equipment, and as called for heating hot water systems, chilled water systems, glycol heating systems and glycol cooling systems operating at or below 125 psi and 200°F. Drain or blowdown valves for water and glycol systems operating above 125 psi and 200°F, and steam systems shall be provided with valves specified in Exhibit 'A'. Provide Cap or plug at valve discharge.

B. Install self-regulating flow control valves as recommended by manufacturer. All flow control valves shall have strainer upstream of valve. Strainer shall be as specified in part 2 – Self Regulating Flow Control Valves.

C. Balance Valves:

1. Provide on zone or riser returns, on each hydronic unit and where called for. Meter connection points shall not point downward.

2. Install device in pipe line per manufacturer's instructions for upstream and downstream distances.

3.2 VALVE SELECTION

A. Provide valve types for the specific services as specified in Exhibit 'A'. Valve changes shall be made only as reviewed by Owner's Representative.

EXHIBIT - 'A' - VALVE TYPE (HVAC)

Notes are at the end of Exhibit 'A'

Service	**Gate**	**Globe**	**Check**	**Ball**	**Butterfly**	**Plug**	**Balancing**	**Special Purpose, Drains and Manual Air Vents**	**Notes**
Hot water heating, glycol heating operating at 125 psi or below (Optional)			CV-01 Class 125 and CV-03 Class 125	BV-03 and BV-08 Class 150	BFV-02		GBV-01	DBV-01	Note 1, 2 and 3
Chilled water glycol cooling operating at 125 psi or below (Optional)			CV-01 Class 125 and CV-03 Class 125	BV-03 and BV-08 Class 150	BFV-02		GBV-01	DBV-01	Note 1, 2 and 3

NOTES FOR EXHIBIT "A":

NOTE 1: Hose threaded drain and vent valves DBV-01 shall only be used on heating hot water, chilled water, glycol heating and glycol cooling systems operating pressure at or below 125 psi and temperature at or below 200°F. Systems operating pressure above 125 psi and operating temperature above 200°F, or sizes above ¾" shall be provided with the listed service valve with the open end of the valve provided with a threaded plug or cap.

NOTE 2: Where options are indicated for the valve connection types (threaded, soldered or welded) in this specification section, refer to Specification Section 232000 for the specific requirement for the connection type for the intended service.

NOTE 3: Silent check valves SCV-01 or SCV-02 shall be used at pump discharges.

END OF SECTION 230523

SECTION 230550 – WIND RESTRAINT FOR HVAC SYSTEMS

1.0 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Support and brace mechanical and related electrical (Div 26) and plumbing (Div 22) systems to resist directional wind forces (lateral, longitudinal and vertical) for components attached to curbs and for curbs attached to structure.

1.3 APPLICABLE CODES AND STANDARDS

A. Provide work in compliance with the following codes and standards.

B. Building Code of New York State, Section 1603.

C. Mechanical Code of New York, Section 301.

D. American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and Other Structures – Standard ASCE/SEI 7-10.

1.4 QUALITY ASSURANCE

A. General:

1. The contractor shall provide calculations and details of wind restraint systems to meet total design lateral force requirements for support and restraint of mechanical and related electrical and plumbing systems, sealed and signed sealed by a New York registered Professional Engineer.

2. Systems requiring wind restraint:

a. Rooftop units.

b. Roof exhaust fans.

c. Roof mounted ductwork systems.

d. Roof Curbs.

e. Pipe Supports.

f. Condensing units

g. Ventilation Penthouses.

1.5 SUBMITTALS

A. Submit wind force level (Fp) calculations for applicable building code. Submit pre-approved restraint selections, installation details, and plans indicating locations of restraints.

B. Calculations, plans, restraint selection, and installation details shall be signed and sealed by a professional engineer licensed in the State of New York and experienced in wind restraint design.

C. Submit manufacturer's product data.

D. For each piece of equipment that requires wind restraint as outlined in this section, include the following:

1. Dimensioned Outline Drawings of Equipment Unit: Identify the center of gravity and locate and describe mounting and anchoring provisions.

2. Anchorage: Provide detailed description of equipment anchorage devices on which the calculations are based and their installation requirements. Identify anchor bolts, studs and other mounting devices. Provide information on the size, type and spacing of mounting brackets, holes and other provisions.

2.0 PART 2 – PRODUCTS

2.1 CODE INFORMATION

A. This project is subject to the wind bracing requirements of the Building Code of New York State, International Building Code and American Society of Civil Engineers ASCE 7. The following criteria are applicable to this project, see Structural Engineering plans for data.

1. Basic Wind Speed (V) (Per ASCE 7-10).

2. Importance Factor (I) (Per ASCE 7-10).

3. Exposure Category (Per ASCE 7-10).

4. Height and Exposure Adjustment Coefficient (Per ASCE 7-05).

5. The mean height of the structure (h_{mean}) shall be determined thru coordination with Architectural plans and the General Contractor.

2.2 WIND BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Design analysis shall include calculated dead loads, wind loads, and capacity of materials utilized for the connection of the equipment or system to the structure.

2. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.

3. All wind restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in Section 2.1.

B. Friction from gravity loads shall not be considered resistance to wind forces.

3.0 PART 3 – EXECUTION

3.1 INSTALLATION

A. Wind Restraint of Piping:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines and all certified data.

2. Installation of restraints shall not cause any change in position of equipment or piping, resulting in stresses or misalignment.

3. Transverse piping restraints shall be at 40-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

4. Longitudinal restraints shall be at 80-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

5. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24 inches of the elbow or ice or combined stresses are within allowable limits at longer distances.

6. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints.

7. Branch Lines may not be used to restrain main lines.

8. Provide reinforced clevis bolts when required.

9. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offset, loops, anchors and guides shall be installed as required to provide specified motion capability and limit motion of adjacent piping.

10. Do not brace a system to two independent structures such as roof and wall.

B. Wind Restraint of Electrical Services:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines manual and all certified data.

2. Installation of restraints shall not cause any change in position of equipment or piping, resulting in stresses or misalignment.

3. No ridged connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

4. Do not install any equipment, piping, duct or conduit that makes rigid connections with the building unless isolation is not specified.

5. Prior to installation, bring to the Architect's/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

6. Bracing may occur from flanges of structural beams, upper truss cords of bar joists, cast in place inserts, or wedge-type concrete anchors. Consult Structural Engineer of record.

7. Overstressing of the building structure shall not occur from overhead support of equipment. Bracing attached to structural members may present additional stresses. The Contractor shall submit loads to the structural engineer of record for approval in this event.

8. Brace support rods when necessary to accept compressive loads. Welding of compressive braces to the vertical support rods is not acceptable.

9. Provide reinforced clevis bolts where required.

10. Do not brace a system to two independent structures such as a roof and wall.

C. Wind Restraint of Ductwork and Equipment:

1. All restraint systems shall be installed in strict accordance with the manufacturer's restraint guidelines and all certified submittal data.

2. The interaction between mechanical and electrical equipment and the supporting structures shall be designed into the restraint systems.

3. Friction clips shall not be used for anchorage attachments.

4. Expansion anchors shall not be used for non-vibration isolated equipment rated over 10HP.

5. Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction and vertical restraints shall be provided to resist overturning.

6. Installation of restraints shall not cause any change in position of equipment or ductwork, resulting in stresses or misalignment.

7. No ridged connections between equipment and the building structure shall be made that degrade the noise and vibration-isolation system specified.

8. Do not install any equipment or duct that makes rigid connections with the building unless isolation is not specified.

9. Prior to installation, bring to the Architect's/Engineer's attention any discrepancies between the specifications and the field conditions, or changes required due to specific equipment selection.

10. Bracing may occur from flanges of structural means, upper truss cords of bar joists, cast in place inserts, or wedge-type concrete anchors. Consult Structural Engineer of record.

11. Overstressing, of the building structure shall not occur from overhead support of equipment. Bracing attached to structural members may present additional stresses. The Contractor shall submit loads to the Structural Engineer of record for approval in this event.

12. Brace support roads when necessary to accept compressive loads. Welding of compressive braces to the vertical support rods is not acceptable.

13. Provide reinforced clevis bolts where required.

14. Do not brace a system to two independent structures such as a roof and wall.

END OF SECTION 230550

SECTION 230553 - MECHANICAL IDENTIFICATION

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 QUALIFICATIONS

A. All identification devices shall comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles.

1.3 SUBMITTALS

A. Prior to Ordering Products: Submit manufacturer's technical product data and installation instructions for each identification material and device. For valve tags include proposed tag methodology, including code number, location and valve function. For piping systems and equipment submit proposed schedule of pipe, equipment and name identification for review and approval. Confirm naming / numbering is consistent with any Owner’s naming / numbering convention.

B. As-built submission – Provide final valve schedule for each piping system in both 8-1/2 in. X 11 in. (minimum) and WORD format, indicating code number, location and valve function.

1.4 MAKES

A. Allen Systems, Inc., Brady (W.H.) Co.; Signmark Div., Industrial Safety Supply Co., Inc., Seton Name Plate Corp., Marking Services Incorporated.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Provide manufacturer's standard products of categories and types required for each application. In cases where there is more than one type specified for an application, selection is installer's option, but provide single selection for each product category.

2.2 PIPING IDENTIFICATION

A. Identification Types:

1. Snap-on type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color coded pipe markers, complying with ANSI/ASME A13.1.

2. Pressure sensitive type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive, vinyl pipe markers complying with ANSI A13.1.

B. Lettering:

1. Piping labeling shall conform to the following list:

Pipe Function	Identification
Heating Water Supply	HWS
Heating Water Return	HWR
Chilled Water Supply	CWS
Chilled Water Return	CWR
Refrigerant Suction	RS
Refrigerant Liquid	RL

2.3 VALVE IDENTIFICATION

A. Valve Tags:

1. Standard brass valve tags, 2" diameter with 1/2" high numerals. Identify between heating and plumbing services with 1/4" letters above the valve number.

2. Equal to Seton Style 300 Cat.

B. Valve Chart:

1. Provide valve chart for all valves provided as a part of this project. Frame and place under clear glass. Hang in Mechanical Room.

2.4 EQUIPMENT IDENTIFICATION

A. General:

1. Provide engraved acrylic or vinyl plates for each major piece of mechanical equipment provided.

2. Nameplates: 3/4" x 2-1/2" equal to Seton Cat. #2060-20.

3. Provide for the following equipment:

a. Air handling units

b. Fans

c. Pumps

d. Chillers

e. Energy recovery ventilators

f. Unit heaters/cabinet heaters

g. Duct coils

h. Terminal units (VAV/CV)

i. Fire dampers

j. Smoke dampers

k. Fan Coil Units

2.5 ABOVE CEILING EQUIPMENT LOCATOR STICKERS

A. Provide ¾" diameter colored stickers on ceiling grid at equipment above ceilings as follows:

1. Fire/smoke dampers – RED

2. VAV Boxes or reheat coils – GREEN

3. HVAC Valves – ORANGE

4. Fans – YELLOW

5. Pumps – BLACK

2.6 DUCTWORK IDENTIFICATION

A. Identification Types:

1. Adhesive Duct Markers, color coded by system. Minimum 2" lettering.

2. Provide arrow indicating direction of airflow.

3. Label outside air ducts with the outside air minimum CFM rate.

4. Label supply air duct main at air handling unit discharge with the unit maximum CFM rate.

B. Lettering:

1. Ductwork labeling shall conform to the following list:

Duct Function	Identification
Return Ductwork	RA
Exhaust Ductwork	EA
Supply Ductwork	SA
Outside Air Ductwork	OA

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide valve tags for all valves provided on project.

B. Provide equipment tags for all equipment listed in Equipment Identification Section above.

C. Provide piping identification with directional flow arrows for all piping on project. Maximum every 10'-0". Provide tags on piping at all coil terminations. For piping installed through rooms, provide at least one pipe label in each room, for each pipe function.

D. Provide Ductwork identification with directional arrows for all ductwork on project. Maximum every 15'-0". Provide at least one duct label in each room for each duct function.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

B. This Contractor shall reference the entirety of Divisions 22 and 23 as they apply to this work.

C. Refer to specification Section 019113 for commissioning requirements related to this project.

D. Refer to temperature control drawings for additional balancing requirements associated with calibration and setup of temperature control sequences of operation. In addition to any additional requirements, all air flow measuring stations shall be field calibrated by traverse or other means that does not introduce duck leakage error into the final setting.

1.2 SUMMARY

A. Provide labor, materials, equipment and services to perform operations required for testing, adjusting, and balancing HVAC systems to produce design objectives, including, but not limited to the following:

1. Pre-demolition testing of existing systems.

2. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.

3. Adjusting total HVAC systems to provide indicated quantities.

4. Measuring electrical performance of HVAC equipment.

5. Setting quantitative performance of HVAC equipment.

6. Verifying that automatic control devices are functioning properly.

7. Calibration of flow (air and water) sensors provided by the 230923 contractor

8. Additional balancing procedures described within the 230993 sequences of operation.

9. Reporting results of the activities and procedures specified in this Section.

1.3 SUBMITTALS

A. Quality-Assurance Submittals: Submit copies of evidence that the Testing, Adjusting, and Balancing contractor and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" article below.

B. Sample Report Forms: Submit required number of sets of sample testing, adjusting, and balancing report forms.

C. TAB Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in "Preparation" article below. Include a complete set of report forms intended for use on this Project with each copy. Included in this plan shall be a thorough description of means and methods pertaining to maintenance of systems balance in detailed coordination with all phasing requirements of this project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit required number of copies of reports prepared, as specified in the Submission of Certified Balance Reports Section, on approved forms certified by the registered contractor; include registration number.

E. Warranty: Submit required number of copies of the warranty specified in the "Warranty" Article below.

1.4 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing contractor certified/registered by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Contractor shall have performed as a member in good standing with recognized procedures for no less than five (5) years including projects of the magnitude and design of this project. Balancing Contractor must be approved by the Engineer. See Section 1.3.

1. Agenda Items shall include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. Testing, adjusting, and balancing plan, including pre-demo work.

d. Work schedule and Project site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow

g. Integration of commissioning functions into TAB Plan.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC or NEBB's Standards for Testing, Adjusting, and Balancing, or approved equal.

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC or NEBB national standards.

E. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. The Owner may occupy all or part of the site and existing building during the entire testing, adjusting, and balancing period as required. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations. It is the intent to have all possible balancing procedures complete prior to any Owner occupancy. Contractor shall perform the necessary work in an expedient and accurate manner which best serves the need of verifying proper installation and operation of the installed systems and allowing prompt Owner occupancy.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls contractor, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Coordinate TAB activities with temperature control system setup and calibration

1.7 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by this Contractor under requirements of the Contract Documents.

B. NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing contractor fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified contractor has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

3. Copy of the performance guarantee shall be included in each final certified air balance report.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide all required instrumentation and tools, including, but not limited to ladders, recording meters, gauges, thermometers, voltmeters, anemometers, Pitot tubes, inclined gauge manometers, magnehelic gauges, amprobes, voltmeters, psychrometers and tachometers. Instruments used shall be accurately calibrated as per AABC or NEBB requirements

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are located as required in the Contract Documents and installed per manufacturer's requirements. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operations. All deficiencies shall be reported to the Engineer in writing within 60 days from award of contract. Failure to provide notice within this time period may require that any devices required for proper balance of these systems be installed at the cost of this contractor.

B. Examine approved submittal data of all HVAC systems and equipment.

C. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions and/or cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems"; or in SMACNA's "HVAC Systems-Duct Design". Compare this data with the design data and installed conditions.

D. Examine system and equipment installations to verify that they are complete and ready for testing.

E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing. Any noted deficiencies should be reported immediately to the Engineer for further action.

G. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

H. Examine strainers for clean screens, removal of startup screens and proper perforations.

I. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature control system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multi-zone units, mixing boxes, and variable-air-volume terminals.

4. Automatic modulating and shutoff valves are properly connected.

5. Temperature sensors are located to avoid adverse effects of sunlight, drafts, and cold walls. Sensors are located to sense only the intended conditions.

6. Sequence of operation for control modes is according to the Contract Documents.

7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

8. Interlocked systems are operating.

9. Changeover from heating to cooling mode occurs according to design values.

M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures immediately to the Engineer for further action.

3.2 PREPARATION

A. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete. Equipment rotation has been checked.

2. Hydronic systems are filled, clean, strainers cleaned, startup screens removed and system free of air.

3. Automatic temperature control systems are operational.

4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices has been provided.

8. Filters are clean and in place, including pre-filters and final filters where applicable.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. All systems shall be tested and verified to be in compliance with the performance characteristics contained in the contract documents. All testing shall be performed in compliance with the requirements of NEBB or AABC Standards for Testing and Balancing, or within the standards described in this section. The more stringent standard shall apply.

B. Adjusting and balancing shall be accomplished as soon as the systems are completed to the extent required to allow the work to proceed, and before the Owner takes possession. Verify that the system is properly vented, cleaned, and strainers are cleared with startup mesh removed prior to balance.

C. Cut insulation, ducts, and pipes for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the Insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan speed control levers, and similar controls and devices, indicating final settings.

E. Adjusting and balancing shall be accomplished under appropriate outdoor temperature conditions. All outdoor conditions (Db, Wb, and a description of the weather conditions) at the time of testing shall be documented in the report.

F. Identify flow balancers and dampers in systems which cannot be manipulated to satisfy balancing requirements. Return to site after remedial actions are performed to adjust corrected systems.

G. Traverse duct mains to determine total air system delivery quantities after all outlets have been set and, if necessary prior to final adjustment if the system does not meet design requirements. A sum of room CFM's is not acceptable.

H. Provide partial system start-up, operation and air balance (i.e. system start up before entire duct/pipe system is complete) to suit Project phasing/construction requirements. Provide damper positioning, etc., as required such that acceptable system operation is possible. Provide final system balance on completed system, including unit and/or damper readjustments.

3.4 FUNDAMENTAL AIR SYSTEM BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan total volume.

1. Determine system diversity factors. Prepare plan to simulate system diversity

2. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

3. Check the airflow patterns from the outside air louvers and dampers and the return and exhaust air dampers, through the supply fan discharge and mixing dampers.

4. Locate start-stop and disconnect switches, electric interlocks, and motor starters.

5. Verify that motor starters are equipped with properly sized thermal protection.

6. Check dampers for proper position to achieve desired airflow path.

7. Check for airflow blockages.

8. Check condensate drains for proper connections and function.

9. Check for proper sealing of air-handling unit components

B. Air System Balancing Procedures:

1. The procedures in this article apply to all supply, return, and exhaust air systems. Additional procedures are required for variable air volume systems; these additional procedures are specified in the following articles in this specification.

2. Adjust fans to deliver total design air flows within the maximum allowable speed (rpm) listed by the fan manufacturer.

3. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

4. Measure static pressure across each air-handling unit component.

5. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions in the event that adverse resulting conditions occur which make the system unable to achieve design performance levels.

6. Adjust fan speed higher or lower as required to meet as installed conditions. Provide new sheaves as required. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan speed changes.

7. Do not make fan speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

8. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design air flows within specified tolerances.

    a. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved. Where sufficient space in submains and branch ducts is unavailable for pitot tube traverse measurements, measure air flow at terminal outlets and inlets and calculate the total air flow for that zone.

    b. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design air flows within specified tolerances.

9. Measure terminal outlets and inlets without making adjustments. Measure terminal outlets using a direct reading hood or the outlet manufacturer’s written instructions and calculating factors.

10. Adjust terminal outlets and inlets for each space to within +/- 10% of design airflow. Make adjustments using volume dampers rather than the dampers at the air terminals, where available.

    a. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.

    b. Adjust patterns of adjustable outlets for proper distribution without drafts.

    c. Where pressure gradients are required between spaces, provide adjustment of supply and return / exhaust air such that the supply vs return / exhaust rate shown on the plan is maintained.

d. Record final air volume and air flow pattern for each inlet and outlet.

C. Variable Air Volume System Additional Procedures

1. Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

2. Direct drive fans – Adjust the maximum HZ on fans to provide for operation at the specified fan speed (for example, 2120rpm with a 1760 rpm motor would be 72 Hz.) plus an allowance for filter loading.

   a. Maintain maximum setting to avoid overload conditions. Consult with Engineer as required to determine maximum setting to be programmed.

   b. Verify that minimum permissible speed (RPM/HZ) limit parameters are within limits permitted by the equipment manufacturer and include this value on the TAB report.

   c. Coordinate with the temperature controls and Div 26 contractors for adjustment of drive parameters.

3. Pressure-Independent, Variable Air Volume Systems – Supply Air: After the fan systems have been adjusted, adjust the variable air volume systems as follows:

   a. Set outside air dampers at minimum; return and relief air dampers at a position that simulates full cooling load.

   b. Perform air terminal TAB per NEBB / AABC procedures. Lock final terminal controller “K factor” into the operating programs for all air terminals.

   c. Select the terminal unit that is most critical to the supply fan airflow and static pressure. Adjust the total system air flow compensating for diversity and determine the necessary duct pressure and enter to the control system. This will be the design or peak static pressure requirement.

   d. For variable volume systems specified to operate with variable pressure control (VVP) – set all air terminals to control to minimum air delivery. Reduce the duct pressure setpoint until at least one terminal damper position is in excess of 80% open. Record and enter this value to the building management system as the minimum reset level for the VVP control strategy.

e. Using diversity compensation, measure total system airflow by traverse for both supply and return air streams. Adjust to within 5% of design airflow. Compare to the sum of the diffusers / registers and report apparent duct leakage in percentage. Record supply fan apparatus data under peak performance conditions.

f. Re-measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return air ducts and inlets as described for Air Systems.

g. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply air sensing station to ensure adequate static pressure is maintained at the most critical unit.

4. Pressure Independent Variable Volume Systems – Return Air / Outdoor Air / Relief Air adjustment

a. Determine the supply to return air flow tracking number based on the sum of total supply and return shown on the construction documents.

b. Calibrate the supply and return air flow stations. Based on the sum of supply vs return and any calibration error in the air flow stations, determine functional offset for supply to return air fans and enter to the BMS.

c. Calibrate the outdoor air flow stations. Enter the outdoor air setpoint to the system per the equipment schedule.

d. Calibrate the relief air static duct pressure sensor. Based on as-installed conditions, determine an appropriate setpoint for relief damper operation. If as-installed conditions preclude a stable operating setpoint, determine an alternate position and coordinate with the temperature control contractor. Enter the relief air damper setpoint to the BMS.

e. Return the system to maximum air flow accounting for system diversity. Record return fan apparatus data under peak performance conditions.

3.5 FUNDAMENTAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5%.

B. Verify that systems are prepared for hydronic systems testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check flow control valves for specified sequence of operation and set at design flow.

C. Hydronic System Balancing Procedures:

1. Set calibrated balancing valves, if installed, at calculated pre-settings.

2. Measure flow at all stations and adjust, where necessary, to obtain first balance.

a. System components that have C_V rating or an accurately cataloged flow pressure drop relationship may be used as a flow indicating device.

3. Measure flow at main balancing station and set main balancing device to achieve flow that is 5% greater than design flow. Where pump selection provides a firm operating point, pump flow may be derived from the pump curve in lieu of the balancing device.

4. Adjust balancing stations to within specified tolerances of design flow rate as follows:

a. Determine the balancing station with the highest percentage over design flow.

b. Adjust each station in turn, beginning with the station with the highest percentage over design flow and proceeding to the station with the lowest percentage over design flow.

c. Record settings and mark balancing devices.

5. Pumps equipped with Adjustable Speed Drives:

a. Where required to achieve specified TAB results, coordinate with the temperature controls and Div 26 contractors for adjustment of drive parameters.

b. Adjust high speed (RPM/HZ) limit parameters to avoid overamp conditions.

c. Adjust high speed (RPM/HZ) limit parameters as necessary to achieve design requirements within the limitations of motor capacity.

d. Verify that minimum permissible speed (RPM/HZ) limit parameters are within limits permitted by the pump manufacturer and include this value on the TAB report.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data as it applies.

1. Manufacturer, model, frame and serial numbers.

2. Complete nameplate data.

3. Efficiency rating if high efficiency motor.

4. Measured voltage and amperage, each phase

5. Starter thermal protection element rating.

3.7 HEAT TRANSFER COILS

A. Hydronic: Measure the following data for each coil.

1. System identification.

2. Location.

3. Coil Type and nameplate data

4. Dry-bulb temperatures of entering and leaving air.

5. For cooling coils – record entering %RH or wet bulb data.

6. For primary coils (Air Handlers, etc.) – Record face velocity and air pressure drop.

7. Record airflow rate

8. Adjust water flow rate as scheduled

9. Adjust bypass water flow on three-way circuits for 50% of total coil water flow scheduled.

3.8 TEMPERATURE CONTROL VERIFICATION

A. Verify that all control devices are calibrated and fully operational.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify free travel and proper operation of control devices such as damper and valve operators.

3.9 TOLERANCES

A. Unless noted to the contrary in other portions of the contract documents, set HVAC system airflow and waterflow rates within the following tolerances.

1. Supply, Return, and Exhaust, Air Inlets and Outlets: +/- 10%, maintaining required pressure balance between adjacent spaces / zones.

2. Fans at +/- 5% of delivery requirements.

3. Water-Flow Rates: +/- 5%.

3.10 FINAL REPORT

A. General: Computer printout in letter quality font, on standard bond paper. Provide 1 hard copy in 3-ring binder, tabulated and divided into sections by tested and balanced systems. Provide PDF copy for project record.

B. A certification sheet in front of binder signed and sealed by the certified testing and balancing agent. All reports shall bear the seal of the certifying agent for the balancing contractor. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: Final report shall consolidate data from all segments of phased project. In addition to the certified field report data, include the following:

1. Fan curves.

2. Pump Curves

3. Manufacturers' test data.

4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance; do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page including:

a. Name and address of testing, adjusting, and balancing contractor.

b. Project name.

c. Project location.

d. Architect's name and address.

e. Engineer's name and address.

f. Contractor's name and address.

g. Report date

2. Signature of testing, adjusting, and balancing agent who certifies the report.

3. Summary of contents, including the following:

a. Design versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

4. Nomenclature sheets for each item of equipment.

5. Data for terminal units, including manufacturer, type, size, and fittings.

6. Report shall document all information items requested within this specification section.

E. Fan Test Reports: In addition to other requirements for supply, return, and exhaust fans, include the following:

1. Fan Data: Include the following:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangements and class.

g. Fan and motor sheave make, size in inches, bore, and key size.

h. Fan and motor sheave dimensions, center-to-center and amount of adjustment in inches.

i. Number of belts, manufacturer, and size

2. Test Data: Include design and actual values for the following:

a. Total airflow rate in cfm.

b. Total system static pressure in inches wg.

c. Fan rpm.

d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

f. Motor data.

F. Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record and report the following data as a minimum:

1. System and air handling unit number.
2. Location and zone.
3. Traverse air temperature in °F.
4. Duct static pressure in inches wg.
5. Duct size in inches.
6. Duct area in sq. ft.
7. Design airflow rate in cfm.
8. Design velocity in fpm.
9. Actual airflow rate in cfm.
10. Actual average velocity in fpm.

G. Air Terminal Unit Reports: In addition to other requirements for terminal units, include the following:

1. Unit Data: Include the following:
    a. System and air handling unit identification.
    b. Location and zone.
    c. Test apparatus used.
    d. Area served.
    e. Air terminal make.
    f. Air terminal number from system diagram.
    g. Air terminal type and model number.
    h. Air terminal size.
2. Test Data: Include design and actual values for the following:
    a. Airflow rate in cfm (minimum and maximum).
    b. Preliminary airflow rate as needed in cfm.
    c. Final airflow rate in cfm.

d. Space temperature in °F.

e. Duct Supply Air Temperature in °F.

H. Instrument Calibration Reports: For instrument calibration, include the following data in report, as a minimum:

1. Instrument type and make.

2. Serial number.

3. Application.

4. Dates of use.

5. Date of calibration.

3.11 ADDITIONAL TESTS

A. Balance Contractor shall be prepared to verify the balance of select devices in the presence of the Engineer and / or Commissioning Authority at their discretion. This typically will require only a few hours to a day of labor, depending on the project scope. If, in the opinion of the Engineer or Commissioning Authority these verifications contain adequate discrepancies to provide doubt to the accuracy of the balance procedures performed, the Engineer or Commissioning Authority may order additional re-balancing or re-verification until such time as these discrepancies are eliminated throughout the systems; this verification shall be at the Contractor's expense.

B. Seasonal Periods: Initial testing, adjusting, and balancing procedures at start-up will not provide a good representative sample of system performance due to seasonal conditions. Therefore the Contractor shall return at a later time to perform the required balancing work, up to 8 hours of balancing work, to address seasonal conditions. This shall not delay the submittal of the certified balance reports for all work otherwise performed.

3.12 SUBMISSION OF CERTIFIED BALANCE REPORTS

A. Time is of the essence in the completion of this portion of the contract. It is expected that the certified balance reports will be submitted in a timely manner, within thirty (30) days of the work performed. At the completion of the project, it shall be the responsibility of this Contractor to assemble a single certified report and submit 1 printed copy to the Engineer as closeout documentation, along with electronic copy in PDF format.

END OF SECTION 230593

SECTION 230700 - INSULATION

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. All work shall comply with the requirements of the 2020 Energy Construction Conservation Code of New York State, manufacturer's requirements for installation and these specifications. In the event of conflicts between these documents, the more stringent requirements shall govern.

B. Provide labor, materials, equipment and services to perform operations required for the complete installation and related work as required in the Contract Documents. The extent of insulation work is indicated on the drawings and by the requirements of this section.

C. Repair all insulation at points of piping and ductwork system tie in to existing and at locations where existing systems are cut, patched or capped.

D. Insulate all existing piping systems, ductwork systems and equipment after removal of existing insulation whether by this contractor or another, including but not limited to removal of asbestos products.

E. Remove existing insulation where indicated on the drawings or specified here-in.

1.2 SUBMITTALS

A. Manufacturers' Data. Submit manufacturer's data and installation instructions.

B. Schedule of insulation applications.

C. Certification: Provide certifications as necessary to show compliance with these specifications and governing regulations. Include proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 232000 – Piping Systems and Accessories.

B. Section 232133 – Water Systems Specialties.

C. Section 233000 – Sheet Metal and Ductwork Accessories.

2.0 PART 2 – PRODUCTS

2.1 GENERAL

A. Insulation, Jackets, Adhesives, and Coatings, shall comply with the following:

1. Treatment of jackets or facings for flame and smoke safety must be permanent. Water soluble treatments are not permitted.

2. Insulation, including finishes and adhesives on the exterior surfaces of ducts, pipes, and equipment, shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less, as tested by ASTM E84 (NFPA 255) and UL 723 methods, using the specimen preparation and mounting procedures of ASTM E2231.

3. Insulation within plenums, duct coverings and duct linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F. Pipe and duct insulation shall be listed and labeled.

4. All adhesives, coatings and sealants used for the insulation shall comply with the maximum Volatile Organic Compound (VOM) limits as called for in the current version of U.S. Green Building Council LEED Credits.

5. Provide materials which are standard insulation products of manufacturers for piping, ductwork and equipment systems.

6. Provide insulation in accordance of MICA and NAIMA standards.

7. Asbestos or asbestos bearing materials are prohibited.

8. Ducts operating at temperatures above 120 degrees shall have sufficient thermal insulation to limit the exposed surface temperature to 75 degrees.

9. The insulation shall be clearly labelled by the manufacturer with the installed thermal “R” values in accordance to the Energy Conservation Code.

10. UL GREENGUARD Gold Certification – all insulation materials shall be GREENGUARD certified, documentation for which shall be contained in the paragraph 1.2.c submittal information.

2.2 ACCEPTABLE MANUFACTURERS

A. Fiberglass and Mineral Wool: Knauf, Manville, Owen-Corning, Certainteed.

B. Polyisocyanurate: Dow Trymer 2000XP, HyTherm.

C. Flexible Elastomeric: Armstrong, Rubatex International, Armacell

D. Calcium Silicate: Industrial Insulation Group (IIG), Johns Manville, Owens-Corning.

E. Removable Thermal Blanket: Insultech, Shannon, Irwin.

F. Adhesives, Coatings, Mastics, Sealants: Childers, Foster, Armacell.

G. Aluminum and Stainless Steel Jacket Material: GIC, GLT, RPR.

H. Laminated Rubberized Bitumen Jacket: Alumaguard, VentureClad, Flex Clad.

I. Pre-Molded PVC Fitting Covers: Zeston, Proto System

2.3 PIPE INSULATION (RIGID FIBERGLASS TYPE)

A. Glass Fiber insulation meeting ASTM C 547, Type II, Class 2, ASTM C 585, ASTM C 795 and ASTM C 1136; rigid, molded, noncombustible.

B. Minimum 'K' Value: ASTM C 335, 0.23 at 75°F mean temperature installed value. Maximum Service Temperature: 1000°F.

C. Vapor Retarder Jacket: ASJ/SSL conforming to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.

D. Field-Applied PVC 30 mil Fitting Covers with Flexible Fiberglass Insulation complying with ASTM C 450 and ASTM C 585: Proto Corporation LoSmoke, UV-resistant fittings and accessories, white or colored. Fitting cover system consists of pre-molded, high-impact PVC materials with blanket type fiberglass wrap inserts. Blanket fiberglass wrap inserts shall have a thermal conductivity ('K') of 0.26 at 75°F mean temperature. Closures to be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations.

2.4 PIPE INSULATION (FLEXIBLE ELASTOMERIC FOAM)

A. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC's, HFC's, HCFC's, formaldehyde, fibers and dust, with low VOC's. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft²•hr.• F/in. at 75ºF mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2" material thickness. Furnish with self-sealing reinforced lap seal.

B. Pipe Insulation: ASTM C534, Type I.

C. Sheet Insulation for Ductwork and Equipment: ASTM C534, Type II, smooth skin one side.

2.5 PIPE INSULATION (CALCIUM SILICATE TYPE)

A. Asbestos free, hydrous calcium silicate, 12 lbs/cu. ft. density minimum complying with ASTM C 533, Type I. Maximum thermal conductivity (k) shall be 0.39 Btu/sq. ft. hr.ºF/in. at 200ºF.

B. Field-Applied PVC 30 mil Fitting Covers and Jacket with Molded Calcium Silicate Fitting Insert: Proto LoSmoke, UV-resistant fitting covers and accessories, white or colored, complying with ASTM C 450 and ASTM C 585. Fasteners for the PVS fitting covers shall be stainless steel tacks, matching PVC tape, or PVC adhesive per manufacturer's recommendations. Prefabricated calcium silicate insulation inserts and fitting covers shall be dimensioned properly to cover valves, elbows, tees, and flanges.

2.6 PIPE INSULATION TAPES

A. ASJ (All Service Jacket) Tape: White vapor retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 4 inches.

2. Thickness Total: 0.19mm

3. Adhesion: Exceeds strength of tape back.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. Make: 3M Venture Tape 1540CW, Owens Corning ASJ Max

2.7 DUCT INSULATION

A. Duct Liner – Refer to Specification Section 233000.

B. Flexible Fiber Glass Blanket:

1. Insulation Blanket meeting ASTM C 553, Type II, ASTM C 1290, Type III, and ASTM C 1138.

2. 'K' Value of 0.27 at 75°F mean temperature. Maximum Service Temperature (Faced): 250°F.

3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, II, III, IV, VIII or FSK conforming to ASTM C 1136 Type II, IV. Provide ASJ jacket for ductwork to be painted.

4. Installation: Maximum allowable compression is 25%.

5. Density: Minimum 1.0 PCF.

6. For duct wrap, the installed thickness shall be assumed to be 75 percent (25% compression) of nominal thickness.

C. Rigid Fiber Glass Board

1. Insulation Board meeting ASTM C 612 Type IA, IB and II, ASTM C 795 and ASTM C 1138.

2. 'K' Value of 0.23 at 75°F mean temperature. Maximum Service Temperature: 450º F.

3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or conforming to ASTM C 1136 Type II, IV. Provide ASJ jacket for ductwork to be painted.

4. Concealed Areas: Minimum 3 lb./ft.^{3}.

5. Exposed Areas: 6 lb./ft.^{3} minimum density for duct less than 8 ft. - 0 in. above finished floor or where indicated in these specifications or on the drawings.

D. Rigid Polyisocyanurate Insulation:

1. Cellular foam complying with ASTM C591, rigid molded, non-combustible. 2 lb./ft^3 nominal density. Maximum thermal conductivity (k) shall be 0.19 BTU-in/ft^2 hr. °F at 75°F mean temperature. Maximum Service Temperature; 300°F.

E. Flexible Elastimeric Foam:

1. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC's, HFC's, HCFC's, formaldehyde, fibers and dust, with low VOC's. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft²•hr.• F/in. at 75ºF mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2" material thickness.

2. Sheet Insulation for ductwork: ASTM C534, Type II, smooth skin one side.

F. Duct Insulation Tapes:

1. FSK (Foil. Scrim and Kraft Laminate) Tape: Foil face, vapor retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

a. Width: 4 inches.

b. Thickness Total: 5.5 mil.

c. Adhesion: 66 ounces force/inch in width.

d. Elongation: 2 percent.

e. Ambient Limits: -40 to 240 deg F

f. Tensile Strength: 39 lbf/inch in width.

g. Make: Owens Corning Thermafiber. 3M Venture Tape 1525CW.

2.8 EQUIPMENT INSULATION

A. Segmented board, sheets, blocks, size, shape, and material as called for.

B. Rigid Fiber Glass Board

1. Insulation Board meeting ASTM C 1393, Type I, II, IIIA, III B and Category 2, ASTM C 795 ASTM and C 1138.

2. 'K' Value of 0.27 at 75°F mean temperature. Maximum Service Temperature: 650º F.

3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, II, III, IV or FSK conforming to ASTM C 1136 Type II. Provide ASJ jacket for ductwork to be painted.

4. Concealed Areas: Minimum 3 lb./ft.^{3}.

5. Exposed Areas: 6 lb./ft.^{3} minimum density for equipment less than 8 ft. - 0 in. above finished floor or where indicated in these specifications or on the drawings.

C. Flexible Elastomeric Foam:

1. Flexible, elastomeric thermal insulation, with expanded closed-cell foam structure, antimicrobial protection and free of CFC's, HFC's, HCFC's, formaldehyde, fibers and dust, with low VOC's. Maximum water vapor transmission of 0.10 perm-inch based on ASTM E96, Procedure A. Maximum thermal conductivity (k) shall be 0.27 Btu/ft²•hr.• F/in. at 75ºF mean temperature. Fire spread/smoke developed rating of 25/50 or less based on ASTM E84 for up to 2" material thickness.

2. Pipe Insulation: ASTM C534, Type I.

3. Sheet Insulation for equipment: ASTM C534, Type II, smooth skin one side.

2.9 PIPE, DUCT AND EQUIPMENT JACKETING

A. Metal Jacketing Material:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14. Sheet and roll stock ready for shop or field sizing. Stucco Embossed: 0.020 inch thickness.

a. Moisture Barrier for Indoor Applications: Minimum 1mil thick, heat bonded polyethylene and kraft paper.

b. Moisture Barrier for Outdoor Applications:Minimum 2.5 mil thick polysurlyn.

2. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.

b. Preformed 2 piece or gore, 45 and 90 degree, short and long radius elbows covers.

c. Flange and union covers.

d. Tee end caps.

e. Beveled collars.

f. Valve covers.

g. Field-fabricate fitting covers only if factory-fabricated fitting covers are not available. Valve covers.

3. Banding: Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316 equal to the jacketing material, ½ and ¾ inch wide with wing seal. Banding. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14, 0.020 inch thick, ½ and ¾ inch wide with wing seal.

B. PVC 30 mil Jacket: High impact resistant, UV resistant PVC complying with ASTM D 1784, Class 16354-C. Roll stock ready for shop or field cutting and forming.

1. Color: White

C. Self-Adhesive, Laminated Rubberized Jacket:

1. Multi-ply laminated rubberized bitumen compound system. UV-resistant aluminum foil/polymer or polyester/foil system with acrylic adhesive.

2. 55-60 mil thickness with a low-pressure sensitive adhering system.

3. Stucco-embossed aluminum finish.

2.10 THERMAL BLANKET

A. Thermal Barrier with a maximum service temperature of 450°F.

B. Outer and Inner Jacket, 17 oz./sq. yd. Silicone impregnated Fiberglass cloth.

C. Insulation Material, 11 PCF Fiberglass Needled Mat-Type "E" Fiber.

D. Mat encapsulated by the silicone impregnated Fiberglass cloth and sewn together, producing a self-contained blanket system.

E. Blanket system fasteners for easy install and removal.

F. The insulation cover shall be 2 in. thickness with a K factor of 0.26 at 100°F.

G. Blanket construction shall be double sewn lock stitch with a minimum 7 stitches per inch. All raw jacket edges shall have a tri-fold Silicone Cloth binding. No raw cut jacket edge shall be exposed. Stitching shall be done with PTFE coated fiberglass thread or PTFE Teflon coated Nomex thread.

H. The blanket shall extend beyond mating flanges unto existing insulation for a minimum of 2 in. Where blanket cannot fit over existing oversized insulation, blanket shall butt up to existing insulation with a friction fit closing seam. All sections of pipes shall be insulated, and open gaps are not acceptable. Blanket diameters which are 2 in. or larger than existing insulation must be end capped to eliminate open air void.

I. The blankets shall have a low point stainless steel drain grommet or incorporate a mating seam at the lowest point of the blanket.

J. For large equipment where a multi-piece construction is necessary, the total number of pieces shall be minimized. Any one piece shall not exceed 40 lbs. in weight.

K. Provide an aluminum or 304 type stainless steel nameplate tag riveted to each blanket piece. 1/8 in. embossed lettering shall identify the equipment it is serving, size and pressure rating of the system. Each blanket requires an I.D. Plate.

L. 14-gauge type 304 stainless steel quilting pins shall be placed at random locations no greater than 18 in. apart to prevent shifting of the insulation, 14 gauge type 304 Stainless Steel speed washers shall secure the quilting pin stem in place.

M. Equipment and equipment heads shall be a multi-piece design installed in tag number sequence. Heat exchanger heads, large vessel flanges and pump housings will be designed in two half sections. Blanket design shall conform to the equipment with minimized air void. All valve covers shall be a two-piece design with a separate body and bonnet.

N. A 21-gauge type 304 stainless steel wire shall be doubled up and twisted in a spiral fashion, with a minimum of 4 to 5 twists per inch. Wire twist length shall be 16 in. or longer. The wire twist shall be secured to the lacing pin at the pin stem. Lacing pin stems shall be 14-gauge type 304 stainless steel. Pins shall be held in place with 1 in. diameter type 304 stainless steel speed washers. Wire twists shall be spaced 6 in. on center along closing seams with matching lacing pins to lace and secure to.

O. Alternate fastening systems such as Metal "D" ring strap with Velcro tab, or side release buckles may be utilized.

2.11 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass Fiber Fabric: Approximately 6 oz. /sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts and equipment. Childers CHIL-GLAS #5 or equal.

2.12 COATINGS, MASTICS, ADHESIVES AND SEALANTS

A. Vapor Barrier Coatings: Used in conjunction with reinforcing mesh to coat insulation on below ambient services temperatures. Permeance shall be no greater than 0.08 perms at 37 mils dry as tested by ASTM D5590 meeting zero growth rate for mold. Foster 30-80 or approved equal.

B. Lagging Adhesives: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 AF meeting ASTM D 5590 with zero mold growth rating, or approved equal.

C. Weather Barrier Mastic: Used outdoors to protect above ambient insulation from weather. Foster 46-50 Weatherite; Childers CP-10 Vi Cryl, or approved equal.

D. Fiberglass Adhesive: Used bond low density fibrous insulation to metal surfaces. Shall meet ASTM C916 Type II. Foster 85-60; Childers CP-127, or approved equal.

E. Elastomeric Insulation Adhesive: Used to bond elastomeric insulation. Foster 85-75; Childers CP-82, or approved equal.

F. Elastomeric Insulation Coating: Water based coating used to protect outside of elastomeric insulation. Foster 30-65, Armacell WB Coating or approved equal.

G. Insulation Joint Sealant: Vapor sealant for below ambient piping with polyisocyanurate and cellular glass insulation. Foster 95-50; Childers CP-76, or approved equal.

H. Metal Jacketing Sealant: Used as a sealant on metal jacketing seams to prevent water entry. Foster 95-44; Childers CP-76, or approved equal.

3.0 PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide Thermal Insulation:

1. Insulation is required on ductwork, piping and equipment in compliance with these specifications and referenced codes and standards.

2. Continuous through openings, sleeves and hangers.

3. Install only on clean, dry surfaces and after ductwork has been tested.

4. On cold surfaces provide continuous unbroken vapor seal. Exceptions - Do not cover inspection stampings, nameplate data, openings, petcocks, hand-holes, manholes, access doors, plugged outlets, air vents, plugged openings or petcocks. Provide continuity of insulation system and vapor barrier though partitions, floors, casings, plenums, etc.

5. Ductwork and Piping insulation exposed to the weather shall be protected from damage, including that due to sunlight, moister, equipment maintenance and wind, and shall be provided with a jacketing material as specified in these specifications.

3.2 PIPE INSULATION

A. Insulate piping systems including fittings, valves, flanges, unions, strainers, and other attachments installed in piping system, whether exposed or concealed, with the following exceptions:

1. Factory-installed piping within the HVAC equipment tested and rated in accordance with the 2020 ECCCNYS

2. Factory installed piping within room fan coil Units and unit ventilators tested and rated according to AHRI 440 and AHRI 840, respectively.

3. Piping that conveys fluids that have a design operating temperature range between 60 and 105 degrees.

4. Piping that conveys fluids that have not been heated or cooled through use of fossil fuels or electric power, the surface temperature of which does not risk condensation or occupant / service hazard (between 60°F and 105°F).

5. Strainers, control valves and balance valves associated with piping 1 inch or less in diameter and conveying fluids over 60 degrees.

B. Piping in exterior walls, spaces, overhangs, attics, or where subject to freezing, double the thickness of the insulation. Piping in wall chases adjacent to an exterior wall shall be packed with type glass fiber batting type insulation.

C. Hanger Shields: Refer to Section "Piping Systems and Accessories."

1. Pre-insulated type: Butt insulation to hanger shields and apply a wet coat of vapor barrier cement to the joints and seal with 3 in. wide vapor barrier tape.

D. Joints in sections of pipe insulation shall be made as follows:

1. Standard: Longitudinal laps and butt joint shall be fully sealed. Factory applied pressure sensitive adhesive lap seal is acceptable.

2. Vapor barrier: For cold services, all service jacket (ASJ) longitudinal laps and 4 in. vapor barrier strip at butt joints shall be sealed with vapor barrier coating. Seal ends of pipe insulation at valves, flanges, and fittings with vapor barrier coating and reinforcing mesh.

E. Fittings, Valves and Flanges:

1. Hot services: Pre-molded fitting insulation of the same material and insulation value as the adjacent pipe insulation.

2. Hot water shall be coated with weather barrier mastic and reinforcing mesh.

3. Provide PVC fitting covers on all fittings.

F. Flexible Elastomeric Foam Pipe Insulation:

1. Split longitudinal joint and seal with contact adhesive. Carefully mate and seal with adhesive all contact surfaces to maintain the integrity of the vapor barrier of the system.

2. Fittings made from miter-cut pieces properly sealed with adhesive, or ells may be continuous. Use templates provided by the manufacturer and assemble the cut section in accordance with the manufacturer’s printed instructions.

3. Where exposed outdoors, apply water-based UV resistant coating and/or reinforcing membrane as recommended by manufacturer. Follow manufacturer’s installation instructions.

3.3 JACKETING ON PIPING

A. Secure jacketing to insulated piping with preformed aluminum band straps or stainless-steel band straps.

B. Jacket exposed insulated fittings, valves and flanges with mitered sections of aluminum or stainless-steel jacketing or factory fabricated, preformed, sectional aluminum or stainless-steel fitting covers shall be fully sealed water tight

C. Provide PVC, aluminum or stainless-steel jacket and fitting covers on exposed insulated piping installed in finished rooms including Mechanical Equipment Rooms, Penthouses, and Machine Rooms within eight feet of the finished floor.

D. Lap all joints a minimum of 2 inches.

E. Secure jacketing in place with a continuous longitudinal friction type joint to provide a positive weatherproof seal. Circumferential joints shall be weatherproof sealed with 2 inch x 0.016 inch thick aluminum straps lined with metal jacketing sealant.

F. Install jacketing to avoid trapping condensation and precipitation.

3.4 DUCTWORK INSULATION

A. External thermal insulation for duct. Not required where ducts have internal acoustical insulation, are located inside the conditioned space and lining meets the insulation value of these specifications and the 2020 ECCCNYS. Make special provisions at dampers, damper motors, thermometers, instruments, and access doors. Apply as Follows:

1. Rigid board type: Impale board over mechanical fasteners, welded pins or adhered clips, 12 in. to 18 in. centers; minimum of two rows per side. Secure insulation with washers on clips. Seal breaks and joints in vapor barrier with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating. Apply tape over corner beading where exposed. Flexible blanket type: Joints and seams made with 2 in. lap of vapor barrier. Round ducts: Apply Foster 85-20 adhesive to ducts in 6 in. brush widths at 1 ft. intervals and at each facing edge. Square ducts: Over 18” duct face width, fasten by impaling insulation on adhered or welded clips. Secure insulation with washers on clips. Seal joints and breaks with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating. Cooling ducts shall be covered with a vapor retarder having a maximum permeance of 0.05perm or an aluminum foil jacket with a minimum thickness of 2 mils. All joints and seams shall be sealed to maintain the continuity of the vapor retarder.

2. Flexible blanket type: Joints and seams made with 2 in. lap of vapor barrier. Round ducts: Apply Foster 85-20 adhesive to ducts in 6 in. brush widths at 1 ft. intervals and at each facing edge. Square ducts: Over 18” duct face width, fasten by impaling insulation on adhered or welded clips. Secure insulation with washers on clips. Seal joints and breaks with 4 in. wide matching tape or 4 in. reinforcing mesh applied with Foster 30-65 vapor barrier coating.

3. Expanded polystyrene: Impale over glued pins, 12 in. to 18 in. centers, minimum of 2 rows per side. Secure insulation with washers on clips. All insulation shall be covered with 0.016" embossed aluminum jacket. Corners shall be protected with aluminum corner bead, screwed to jacketing. All seams and breaks to be weatherproofed and caulked. All joints to be cleanly finished.

4. Flexible Elastomeric Foam Insulation: Apply foam sheet insulation to ductwork with adhesive. Insulate duct seams, angle bracing and reinforcing with same thickness as ductwork. Where exposed outdoors, apply UV resistant coating as recommended by manufacturer. Follow manufacturer's installation instructions.

5. Insulate the tube bends and all exposed surfaces of duct coils operating in excess of 10 degrees differential from ambient conditions.

6. Ductwork installed outdoors, exposed to weather.

   a. All duct insulation on ductwork installed outdoors shall be adhered 100 percent using Approved Contact Adhesive.

   b. Apply self-adhesive, laminated rubberized jacket per manufacturer's requirements. Apply to each side, starting with the bottom surface, then the sides, and finally the top. Provide minimum 3" overlap of material at each joint.

   c. Application:

      1) Flat ducts in a horizontal plane must be sloped to shed water. There must be no areas of ponding water.

      2) Install system over only clean, dry insulation base. Any insulation which becomes damp or damaged shall be removed and replaced prior to installation.

B. Service and access openings shall not be concealed by duct coverings unless the exact location of the opening is properly identified.

C. Continuous vapor barriers shall be provided on all ductwork subject to condensation. No gaps or methods for air to permeate the insulation materials below the vapor barrier shall be permitted.

3.5 EQUIPMENT INSULATION

A. Equipment insulation surfaces shall be a hard, smooth, uniform finish. Install Work ready for painting.

3.6 RECOVERING

A. Field apply glass cloth and applied over standard insulation jacket with lagging adhesive. Properly cut at fittings to avoid wrinkles and coat with lagging adhesive. Leave ready for painting.

3.7 EXISTING INSULATION

A. Patch existing insulation damaged during the course of the work.

B. Report any deficiencies in existing insulation systems to the Owner's Representative for further action.

3.8 EXISTING WORK

A. Insulate existing piping, ductwork and equipment where called for.

EXHIBIT "I" - PIPE INSULATION MATERIALS

SERVICE	**INSULATION MATERIAL**	**THICKNESS**	**REMARKS**
Hot water and glycol/hot water (200°F and lower)	Glass fiber **(k=.25-.29)**	1-1/2 in. and Larger: 2 in. 1-1/4 in. and Smaller: 1-1/2 in.	
Chilled Water, glycol/chilled water (40 deg. F - 60 deg. F)	Glass fiber **(k=.21-.27)**	1-1/2 in. and Larger: 1 in. 1-1/4 in. and Smaller: 1/2 in.	
Refrigeration Piping (Suction and liquid lines)	Elastomeric Foam	1 in. and Larger: 1 in. 3/4 in. and Smaller: 1/2 in.	
Outdoor Refrigeration Piping (Suction and liquid lines)	Elastomeric Foam	1 in. and Larger: 1 in. 3/4 in. and Smaller: 1/2 in.	Insulation shall be provided with a UV resistant coating, Aluminum Jacket (Note 1)

Note 1 – Provide UV coating for outdoor refrigerant on the roof. Provide Aluminum Jacketing on grade level refrigerant piping.

EXHIBIT "II" - DUCT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
HVAC Supply	Exposed: Rigid fiberglass Concealed: Flexible fiberglass	1-1/2 in. 2 in.	Min. installed R value of 6 Min. installed R value of 6
Supply ducts, exposed within the conditioned space served where space and supply air are within 15 degrees of ambient.		NOT INSULATED	Does not include the associated supply ductwork within the Mechanical Room or supply duct to the conditioned space.
Return-air ducts within heated building envelope		NOT INSULATED	
Air conditioning supply (insulated double wall)		1-1/2 in.	Total insulation value provided to meet R value of 8 where ductwork air stream is more than 15 degrees from ambient.
Neutral ventilation air supply (between 65°F and 80°F)		NOT INSULATED	
Outside air ducts and plenums, connections and mixing boxes	Rigid fiberglass	2 in.	Min. installed R value of 8 Provide neat fit at intake plenum

Exhaust, relief or vent ducts and plenums	Exposed: Rigid fiberglass Concealed: Flexible fiberglass	1-1/2 in. 2 in.	Min. installed R value of 8 Insulate 15 ft. from exterior opening and plenums
Outdoor Ductwork	Polyisocyanurate board Elastomeric Foam, Rigid Fiberglass	2-1/2 in. layers 3 in. layers	Supply, return and energy recovery exhaust ducts min, installed R value of 12. Cover with Self-Adhesive, Laminated Rubberized Jacket

General Note – use duct liner only where specified or called for on drawings. Where duct liner is called for provide external insulation to balance of specified R value.

EXHIBIT "III" - EQUIPMENT INSULATION MATERIALS

SERVICE	INSULATION MATERIAL	THICKNESS	REMARKS
Air removal assemblies, air and dirt removal assemblies, side stream filter system and filter assemblies		SAME AS WATER PIPING	
Cooling system expansion tanks, chilled water buffer tanks and chemical feed tanks (40 deg. F - 60 deg. F)		SAME AS WATER PIPING	
Chilled water pumps and cold heat exchangers	Flexible sheets of Elastomeric foam	1 in.	Arrange for easy removal. Coat with white finish.
Chilled water pumps and cold heat exchangers	Polyisocyanurate	1 in.	Construct a "box-style" to cover with removable access sections where required. Seal all joints with manufacturer's recommended vapor barrier.

END OF SECTION 230700

SECTION 230923 – TEMPERATURE CONTROL SYSTEMS

1.0 PART 1 – GENERAL

1.1 FUNCTIONAL INTENT

A. Accessibility: As much as practical, design the system to keep the BACS equipment out of, and above user areas. The maintenance staff must have quick and ready access with sufficient room for operation and maintenance.

B. Reliability: Controls are integral to maintaining reliable conditions throughout the building and as such need to be designed and installed with an appropriate degree of robustness and reliability.

C. Digital Terminal Unit Control - This intent of this standard is to require digital electronic control down to the terminal level. Terminal level controls will typically be cost-effective controllers designed for the specific application. Stand-alone local controls may only be used when specifically approved by the Engineer.

D. Expandability - When configuring the BACS equipment, provision must be made for expansion that may be required in the future. Hardware and software required to implement expansion must be provided via system sizing, configuration, and appropriate license agreements

E. When a portion of an existing building is to be renovated, the new control system shall match or integrate seamlessly with the existing control system.

F. Unless stated to the contrary, all hardware points (AI, AO, BI and BO) shall be hardwired to controllers. Data points / BACNet Objects are only to be accessed through equipment integration where specifically called for.

1.2 RELATED SECTIONS

A. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 019113 – Commissioning Requirements

2. Section 230514 – Electric Wiring

3. Section 230593 – Testing and Balancing

4. Section 262923 – Adjustable Speed Drives

1.3 DEFINITIONS

Binary Input (BI)	An on/off indication that has a maximum cycle rate of 1 Hz. This is typically sensing a contact closure
Binary Output (BO)	A contact closure on the controller that will cause inaction in the system
Binary Value (BV)	A network-visible binary point whose value is determined by a controller computation

Analog Input (AI)	A continuously varying voltage or amperage signal that is varied by a sensor in relation to a sensed variable. This signal is processed in the controller after an analog-to-digital converter on the controller that converts the analog signal to a digital value
Analog Output (AO)	A continuously varying voltage or amperage signal that is generated from the controller after digital-to-analog conversion. The voltage or amperage signal will be used, for instance, to drive a modulating actuator or reset a hardwired set point on a packaged device. 6. Analog Value (AV): A network-visible analog point whose value is determined by a controller computation
Analog Variable / Value (AV)	A network-visible analog point such as a setpoint or calculation result whose value is determined by a controller computation or user input
Building Management System (BMS)	Integrated DDC Temperature control system used both for system operation and troubleshooting meeting the requirements of this specification.

1.4 WORK INCLUDED

A. Provide labor, materials, equipment, services and warranty for a complete installation, startup and commissioning of motor control wiring and temperature control wiring as required in Contract Documents.

B. Provide wiring and conduit required to connect devices furnished as a part of, or integral to the automatic temperature control system, and for motor control and interlocks regardless of the source of supply.

1. Control wiring includes, as required, 120 volt and lower voltage wiring for control signals directing equipment operation. Control circuits shall be 24VAC in general, and no more than120 VAC where required.

2. Provide wiring in accordance with the requirements specified in Division 26, "Electrical", Section 230514 and the National Electrical Code.

3. Provide all devices required for proper system operation including electrical switches, transformers, disconnect switches, relays, device controllers and control modules, hubs, routers, temporary servers, actuators, transducers, sensors, safety devices, power supplies, mode selecting switches, enclosures, and circuit breakers.

4. Provide complete wiring and terminations. Provide all assembly, programming and test of all items as necessary to create a coherent system, encompassing all combined intents of design, drawings, specifications, addenda, and professional quality of work.

5. Assembly of all damper linkages and shafts, including extension through duct walls where applicable and mounting of actuators shall be by the Temperature Controls Contractor.

6. Mounting of all actuators and sensing devices shall be by the Temperature Controls Contractor.

C. The temperature controls contractor shall be responsible for extending 120vac power from designated power panels / circuit breakers to all temperature control panels.

D. Contractor shall provide calibration testing and required adjustment to CO2 space and ductwork sensors one year after system is commissioned. Refer to paragraph 2.2 of this section, Table 1 for CO2 sensor accuracy and "Common Elements" drawing H5.00 of the contract documents. If sensor is not within tolerance, device shall be replaced at contractors' expense.

E. Provide support requirements for Commissioning as described in Section 019113. The DDC temperature control system is a primary tool for HVAC Commissioning.

F. Coordinate all work with factory provided equipment controllers.

G. Coordination: Work with the Engineer, Commissioning Agent, air-balancing contractor, ventilation contractor, piping contractor and electrical contractor to provide proper and obstruction free component location, and system commissioning.

H. Removal of all existing controls called to be removed, including all pneumatic tubing from the device removed back to the source and capped.

1.5 WORK NOT INCLUDED

A. Power wiring for motors, motor starters, adjustable speed drives, as well as the motors, motor starters, and adjustable speed drives (except in the case of equipment specified to have packaged controls/starters) are included in Division 26, "Electrical," unless otherwise called for.

B. Electrical wiring, interlocks or components specifically called out in the electrical specifications or drawings shall be included in the Division 26 scope of work.

1.6 ACCEPTABLE MANUFACTURERS

A. The Cicero North Syracuse School District existing Building Management System is Siemens Controls as installed by Siemens. The project is designed and based upon the extension of this system.

B. All control systems in each building shall seamlessly integrate with the existing system without the use of integrator panels, routers, or any other hardware or software. The control system manufacturer shall guarantee that all new controls operate with the existing Siemens systems.

C. All temperature control equipment for the project shall be purchased by the district via state contract and tuned over to the HVAC Contractor for installation. The HVAC Contractor shall be responsible to provide the service to develop the Direct Digital Temperature Controls System documentation, programming, installation of the equipment, and commissioning such that the project has a complete and workable Direct Digital Temperature Controls System compliant with the requirements of specification section 230923.

D. Basis of Design – Siemens

1.7 WORK INCIDENTAL TO TEMPERATURE CONTROL CONTRACTOR

A. The temperature control contractor shall furnish the following materials, for installation by the contractor responsible for HVAC piping and sheet metal (Sections 232000 and 233000) scope of work.

B. For piping work - Section 232000 Contractor shall install:

1. Control valves in piping.

2. Immersion sensing wells in piping systems.

3. Valved pressure taps (typically for pressure switches or sensors)

C. For sheet metal work - Section 233000 Contractor shall install:

1. Automatic Control Dampers:

a. Control dampers, at the direction of the Temperature Controls Contractor.

2. The Mechanical Contractor shall provide access doors or other means of access through ducts or ceilings and walls for service and adjustment of controllers, valves, and dampers.

D. Control system manufacturer or their authorized representative shall furnish written details, instructions and supervision for the above trades to ensure proper installation, size, and location of any equipment furnished for installation by others.

1.8 QUALITY ASSURANCE

A. Acceptable Products: All products shall be proven to be functional and suitable in accordance with this specification for a period of warranty commencing on the day of transfer of completed project to the Owner. Demonstration of such warranty may be required prior to the submittal approval.

B. Contractor Qualifications: The Temperature Controls Contractor shall be factory-authorized by the respective manufacturer to provide pertinent installation and service.

C. Any subcontractors in employ of the Temperature Controls Contractor on this project must receive prior approval to be permitted work on this project.

D. Field Representation: The Temperature Controls Contractor shall staff the project with a field representative that has been factory-trained in the installation, programming and commissioning of the equipment specified. This representative must be in the direct employ of the Temperature Controls Contractor.

E. Coordination of Work During Construction – this contractor shall:

1. Protect work installed by other trades

2. Coordinate its work with other trades

3. Repair any damage caused by his work

4. Promptly correct all work that Engineer finds as defective or failing to conform to Contract Documents

5. Bear all cost of correcting of work found defective as described above.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. Product Data: Submit for approval the manufacturer's technical product data for each component furnished as part of the control system. Data shall include dimensions, capacities, performance characteristics, electrical requirements, and material finishes. Data shall also include installation and start-up requirements.

B. Shop Drawings: Submit for approval control drawings detailing the following:

1. Network Block Diagrams and System Riser Diagrams: These diagrams shall depict all DDC components that make up the network. They shall provide specific detail on network terminations, and panel power requirements, including breaker allocation. Each DDC panel within the diagram shall list the equipment that it is controlling.

2. Point-to-point Termination Detail: These drawings shall be created for each unique control application type. Drawings that are typical for similar application shall state the application and quantity of that they represent, and the specifics for each. All wiring and piping required to install and operate the system shall be represented in these details. For terminations that are unknown at the time of submittal, or introduced over the course of project, properly designate these as “Field determined terminations,” and include in the As-built Drawings after completion. All wiring and piping shall be number coded on the drawings. These tag numbers shall be used during the installation, and shall appear at both ends of all conductors, including within any junction boxes.

3. Provide individual details for each control type, as described in the Sequence of Operation.

4. Provide spreadsheets of schedules for dampers, valves, wiring, fans and other miscellaneous components if they are part of this control contract showing sizes, characteristics, model numbers and specific locations.

5. For prefabricated control panels, provide panel’s interior and exterior layout details. These details shall depict the equipment layout and shall detail the panel wiring and piping.

C. Product Data: The BACS vendor shall submit manufacturer’s technical product data for each control device, panel, controller, and accessory furnished indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also, include installation, start-up, calibration, and maintenance instructions as well as all cable and tubing requirements.

D. Database Information: The submittal package shall contain detailed information on the point naming convention that is to be used.

E. Provide documentation for all sequences of operation that cannot be performed by stand-alone controllers and require non-controller-resident programs, or programs requiring retransmission to be effective on the controller's output. Wherever possible, sequences of operation and associated inputs and outputs shall be contained on a single controller.

F. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface. All controllers and operator interface shall fully conform to ANSI/ASHRAE 135-2016: Data Communication Protocol for Building Automation and Control Systems (BACNET).

1.10 OPERATION AND MAINTENANCE MANUALS FOR COMPLETE PROJECT

A. Upon completion of installation and prior to the training, provide manuals containing the following information:

1. Installation and Service Manuals for all products and components

2. Calibration and Troubleshooting Procedures for all installed equipment and components.

3. List of location of all enclosures, controllers, sensors, transformers and other components as specified above

4. As-built Control Drawings with all modifications, changes and wiring details that depict actual installation. These shall include all final controller and device names, locations for concealed components (pressure sensors, etc.),wire tags, etc.

5. Sequence of operation – Describing in detail the operation of every piece of equipment subject to control by the DDC system. Each section of the sequence should contain the following:

a. Overview – describes what the intent is, what components are involved and provides a concise description of the piece of equipment to be described.

b. Occupied Mode – Describes the operation of this system during occupied periods.

c. Unoccupied Mode – Describes the operation of this system during unoccupied periods.

d. Alarm Mode - Describes operation of the system in the event of alarm condition and steps to restore system to normal operation. List all anticipated alarm conditions.

e. Each Component's individual Sequence - Describes the detailed operation of each component and how it interacts with the entire system.

6. Listing of the entire DDC controllers with database, software and programs and program locations.

7. Provide spreadsheets of schedules for enclosures, control modules, dampers, valves, wiring, fans, well, tap and other miscellaneous components if they are part of this control contract showing sizes, characteristics, model numbers and specific locations.

B. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.

C. Backup database information in electronic format (other than resident on computer hard drive) to be left on-site that will allow the Owner to fully download the entire DDC System software, including programming point database, configuration, graphic screens and all library of typically composed objects, and details supporting navigation, screens and graphics.

D. Within five working days from the time of the final system commissioning, one (1) hard copy and one (1) electronic copy in PDF format of Operation and Maintenance Manuals shall be turned directly to the Engineer.

E. A Programmers Manual shall be provided with graphic and text descriptions of all functions required for software modifications and developments. The use and installation of high-level programming language shall be included in this manual. The manual shall include ASCII text (or block diagram printouts for graphical programming language based systems) of all DDC programs with the spreadsheet inventorying the name and location of each program. Each file shall be accompanied by a “plain English” description of the program operation by subroutine to assure that future programmers can easily modify the existing database. The manual shall contain computerized printouts of all data file construction including all point information, physical terminal relationships, scales and offsets, alarm limits, messages, schedules, etc. The manual should also contain:

1. System overview

2. Networking concepts

3. Launching browsers from log in

4. Schedule manipulation

5. Software upload and download instruction, including field devices

6. Trend and alarm creation and maintenance

7. Report generation

8. Backup procedure for entire system and modular controllers

9. Sequence of Operation

F. Section for each Major Piece of equipment – Contains the cutsheets for the controllers, custom programs, and relevant information pertaining to that piece of equipment. (IE: schedules for AHUs showing Equipment Tag, Controller address, serial #, airflow, and pertinent engineering units like MBH, GPM, etc…).

G. Wiring Details – Contains 8-1/2" x 11" drawings of all the wiring details shown throughout the set of drawings.

H. Instrumentation Cut sheets – Contains the Manufacturer's original cut sheets for all the instrumentation used on the job. (IE: Well sensor, transformers, enclosures, pressure sensors, etc.).

I. AutoCAD Drawings – All drawings shall be provided in Auto CAD format (i.e. each file format should have the ".dwg" extension), made as set of both, a set 11"x17" black and white and a set of 24"x36" (1 color set and 3 black and white sets). Drawing Sets consists of the following:

1. System Description Drawing – Shows the overview of the job and what is being controlled.

2. Network Riser Drawings – Shows how the network is connected between all the devices on the job

3. Detail drawing(s) – Shows all the wiring and piping details for the entire job – all other drawings refer to these drawings.

4. Individual Control panel drawings & Schematics (1 or 2 drawings per piece of equipment) Shows the EXACT wiring and layout of each control panel. Also shows the schematic representation of the system that is being controlled. (IE: AHU, HW Plant, Fan Coil, Etc.)

5. Controls Floor plans (at least 1 for each floor) – Shows the approximate location of the control panels, thermostats, equipment, network wiring, thermostat wiring and any specific controls required for the job. All this information is overlaid on top of the mechanical floor plan showing the architectural layout (Wall and room #'s).

J. All above shall be copied to a CD (or another approved electronic format) and released to the Owner.

1.11 SYSTEM PRE-COMMISSIONING

A. In addition to responsibilities described within section 019113, and prior to formal project commissioning contractor shall complete the following Pre-Commissioning requirements to assure operational readiness of equipment prior to conducting commissioning.

B. Equipment Start-up: Upon completion of installation, all equipment being controlled shall be initially started and tested on site using a workstation configured identically to that to be presented for permanent use by the Owner, including graphical user interface. Upon completion of all system pre-commissioning (and 019113 commissioning) the entire contents of the workstation, including all changes and corrections performed during these phases, shall be re-loaded to the permanent operator workstation.

C. System Pre-Commissioning shall document the following:

1. Measure, calibrate and adjust all analog inputs. This is to be performed in a manner that verifies that sensors meet the accuracy requirements as specified for the device. All measurements shall be taken using an instrument certified for accuracy within a 12 month period.

    a. Where multiple sensors are “in line” within an air handling system – such as VAV leaving air temperature sensors vs an AHU leaving air temperature, or return / mixed / coil discharge sensors (with economizer correctly positioned) within an air handler, only one of the sensors need be directly measured, and the balance may be validated against the reference sensor.

    b. Where multiple sensors are “in line” within a piping system, the system may be manipulated such that only one sensor need be directly measured, and the balance may be validated against the reference sensor.

2. Stroke all analog outputs from 0% to 100%

    a. Visually verify that all linkage adjustments are set properly.

    b. Verify and record range of operation for ASD commands

    c. Verify and calibrate ASD feedback signals to correspond with command signal and actual operating speed in either RPM or HZ.

3. Valves and Dampers shall fully close and provide tight shut-off.

    a. Hydronic coils – verify that no temperature rise / drop occurs with the valve commanded fully closed

    b. Economizers – Verify return air temperature =mixed air temperature at 100% return air position, mixed air temperature = outdoor air temperature at 100% outdoor air position

4. Verify that all binary outputs are properly energizing the controlled device.

5. Verify that all binary inputs are properly calibrated to accurately reflect status of monitored equipment

6. Adjust setpoints so that equipment operates properly. Tune all PID control loops to avoid unnecessary cycling of control equipment, overheating, sub-cooling, tripping of freezestats or other limit switches and safeties. Create trends for review by the Engineer and Commissioning Agent.

7. Provide control and operational assistance to the balancing personnel during testing and balancing procedures.

D. Communication Network Start-up: Verify from a host computer that all configured controllers are engaged in proper communication passing all configured points to viewing stations. Verify communication speed and level of transactions until it is acceptable and meets the requirements of this specification.

E. Software Verification: All programs and software functions shall be verified to be in compliance with the contract documents for proper sequence of operation.

F. Pre-Commissioning Report: A report shall be provided to the Engineer detailing the dates, times and person(s) performing each phase of the specified system pre-commissioning. This report shall detail when and who performed the individual processes described in this section, and documents the results of all testing procedures. Coordinate phasing of work such that this can be completed PRIOR to formal system commissioning.

G. Project commissioning is considered complete only once the following are completed:

1. Pre-commissioning as described under this paragraph 1.11 is performed, the associated report submitted and approved. All points connected to the BMS shall operate in full compliance with this specification before project substantial completion is acknowledged.

2. The project formal commissioning as outlined under section 019113 is performed, including completion of all remedial work to correct Issues log items,

3. A physical walk-though of the project, conducted by the Engineer or Commissioning Agent and attended by the Temperature Controls Contractor and Owner or their authorized representative is concluded

4. The complete set of required closeout documentation is provided by the contractors. The Owner has no right to refuse or delay a reasonably scheduled walk through. The Owner and Engineer shall determine the level of detail required for the walk-through, and may take this to a component level inspection, at their discretion.

1.12 TRAINING

A. Provide BMS training for up to four (4) Owner selected personnel.

B. After Section 019113 Commissioning is complete as specified, the Temperature Controls Contractor shall provide an on-site session detailing the layout of the BMS. This shall include network wiring routes, control panel locations, transformer locations, etc.

C. The Temperature Controls Contractor shall then provide an on-site session to review the entire Operations and Maintenance manual(s) with the Owner. This session shall also include but not be limited to:

1. Fundamental operation of the system

2. Training on setpoint adjustment and scheduling modifications

3. Operation and sequencing of control loops for all mechanical equipment being controlled

D. Provide telephone support and answer system relevant questions throughout the warranty period.

1.13 WARRANTY

A. Warranty for the entire control system shall commence upon completion and acceptance by the Engineer of the system commissioning as specified. The warranty includes fine-tuning of all dynamic elements of control system to achieve reasonable, efficient end equipment protective mode of operation.

B. Provide a one-year warranty on all DDC controllers.

C. Provide a one-year warranty on all other components.

D. Disclose to Owner and accommodate longer warranty periods if provided by components manufactured at the time of purchasing.

E. The Contractor shall provide all OEM recommended preventative maintenance of the installed work as described in the operating and maintenance manuals during the warranty period. In addition, the Contractor shall provide two (2) semi-annual service visits (i.e., one visit during the peak cooling season and one visit during the peak heating season) to test and evaluate the performance of the installed work. The Contractor shall provide a written report of the test and evaluation results. The service visits shall include, but not be limited to:

1. Checking and, if necessary, correcting the calibration of the sensors, transducers, and transmitters for airflow, liquid flow, pressure, and temperature.

2. Checking and, if necessary, correcting the operation of the dampers and damper actuators.

3. Checking and, if necessary, correcting the operation (i.e., monitoring and command) of the system points, graphics, and display functions.

F. Software and Hardware Updates: At the end of the first six months after acceptance, and during the subsequent six-month period, the BACS contractor shall update the equipment and any controllers, servers, workstations and HMI web servers with the latest modification and improvements in software, firmware, and hardware that the manufacturer may have incorporated in the furnished equipment.

G. Contractor shall, during the ensuing four seasons (one year), conduct periodic inspections and fine-tune all dynamic elements of the system with all costs of testing to be included in this scope of work.

2.0 PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General Requirements

1. A distributed logic control system, complete with Direct Digital Control (DDC) software shall be provided. This system is to control all mechanical equipment, as described on the project drawings and these specifications.

2. All controllers for terminal units, air handlers, central mechanical equipment and the Microsoft Windows-based operator's terminal(s) shall communicate and share data.

3. All controllers shall be fully programmable.

4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.
5. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall also be able to send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device.
6. All control points associated with a single piece of equipment (air handler, VAV air terminal, heat exchanger, pump control, etc.,) shall be wired to the local controller. Network sharing of data via the network, for example, remote monitoring of a temperature sensor to control a valve or other devices, shall not be permitted without advance permission from the Engineer.
7. The Temperature Controls Contractor shall assume complete responsibility for the entire controls system as a single source, providing installation, program debugging and service of all portions of logic control system. This shall include designated server, operator’s terminal, global controllers, routers, terminal unit controllers, sensors and all other sections of the system.

8. During construction, at least one operator's terminal shall be equipped to act as a system server / operator interface. This system server shall store copies of all installed software for all field components and shall be capable of automatic or manual reloading of such software into the field components as required. The system server shall also gather and archive system-operating data, such as trends, energy logs, and other historical operating data. Complete energy management firmware, including self-adjusting optimum start, demand limiting, global control strategies and logging routines for use with total control systems shall be supplied. All energy management firmware shall be resident in field hardware and shall not be dependent on the operator's terminal for operation. Operator's terminal software is to be used for access to field-based energy management control firmware only. All schedules shall be module resident and shall not be affected in case of interruption network transport between the module and the host station.

9. Upon completion of the project, the Contractor shall transfer and install to all software, graphics, etc., associated with the scope of this project to the existing operator workstations.

B. Basic System Features

1. Direct digital logic control of temperature, scheduling, optimum start, equipment alarm reporting and override devices for unoccupied mode of operation.

2. Operator's terminal software (Graphical User Interface or GUI) shall run under Microsoft Windows operating system. Software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Operation of the terminal software shall be simple and intuitive.

3. Operator's terminal software shall contain graphical user interface software, allowing configuration of system-wide controllers.

4. Provide all communication media, connectors, repeaters, bridges, switches, and routers necessary for network communications and interface to the internet as required to allow for remote access to system operations.

5. The system shall meet peer-to-peer communication services such that the connection of any operator interface to any one controller shall allow the operator to interface with all other controllers. The software shall provide transparent viewing and editing of all data, control programs, schedules, trends, alarms from any one controller through connection to any other controller on the internet work, regardless of subnetwork routers.

6. Priority password security systems shall prevent unauthorized use. Each user shall have an individual password. The user shall only be given access to the system functions required for individual job performance.

7. Equipment monitoring and alarm functions, including information for diagnosing equipment problems shall be included with the system.

8. The complete system, including, but not limited to terminal unit controllers, higher level controllers and operator's terminals shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in any controller's memory shall reside error free for a minimum of 30 days. Logic controllers for all air handlers and all unitary equipment shall utilize EEPROM or battery backup for all variable data storage.

9. System design shall be modular.

10. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal shall be provided.

11. System shall be capable of equipment runtime totalization of fans, heaters, boilers, etc. And capable of alarm generation and alarm dial out.

12. All hardware shall be listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916 in both the US and Canada, with integral labels showing rating.

13. All hardware shall be in compliance with FCC Part 15, Subpart J, Class A.

2.2 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation.

1. Graphic Display. A graphic with a minimum of 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec.

3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.

5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.

6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 1 sec. Select execution times consistent with the mechanical process under control.

7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.

9. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 1.

Table 1 - Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Water Flow	±2% of full scale	
Dew Point (note 1)	±1.5ºF	
Water Temperature	±1.2 ºF	
Air Pressure (note 2)	±0.05 in. w.g.	1-6 in. w.g.
Air Pressure (note 2)	±0.03 in. w.g.	±0.25-1 in. w.g.
Air Pressure (note 2)	±0.005 in. w.g.	±0-0.25 in. w.g.
Airflow	±5% of full scale	
Space Temperature	±1.0ºF	
Duct Temperature	±1.2ºF	
Fluid Pressure (note 2)	±0.5 psi	
CO2 Sensors	50ppm	400-2000ppm

NOTE 1: Accuracy applies to 10% - 90% of scale
NOTE 2: For both absolute and differential pressure

GENERAL NOTE - Sensors to be selected such that measured media is near middle third of sensor range

2.3 TEMPERATURE SENSORS

A. General

1. Sensors shall have a limited lifetime warranty.

2. All devices shall use precision thermistors unless stated to the contrary in this section.

3. Provide NEMA 1 termination box unless otherwise specified

B. Sensor Specifications

1. Space Sensors:

a. Standard Space sensor shall be available in an off-white enclosure for mounting in a standard electrical box. Mount at 48” height.

b. Sensors in public areas shall be provided without local temperature indication, setpoint adjustment or setback override.

c. Sensors in private / staff only areas shall be provided with local temperature indication, setpoint adjustment and setback override functions.

d. Where potentially subject to damage (stairwells, gyms, corridors) or as directed by the Owner or Engineer, provide bushed stainless steel blank wall plate type sensors.

e. Where determined cost effective and approved by the Owner and Engineer, the use of wireless room temperature sensors shall be permitted. Siemens QAA2391.FWTC (with temperature display) override and setpoint adjustment) or QAA2301.DWTC (temperature display only) or approved equal. Contractor shall be responsible for components and requirements necessary to eliminate operational conflicts between these components and other systems within the facility.

f. Where space sensors are connected to dedicated terminal unit controllers, they shall be equipped with local communication interface for troubleshooting and balancing purposes. Provide all required wiring from the terminal controller to the space sensor to allow for interface to a local laptop interface device.

g. Wall Plate Sensors - Blank wall plate style sensors, Kele KTP Stainless Steel Flush Mounted Thermistor and RTD Sensors or approved equal. Provide only where specified or called out on project drawings

2. Duct Sensors:

a. Single point duct mounted sensors shall have a minimum 8" rigid probe and be used when the duct size is less than 24"or where duct stratification is not present, such as downstream of fans.

b. Averaging duct-mounted sensors shall have a minimum 8’ long averaging element and be used when the duct size is greater than 24". Where multi-point thermistor averaging sensors are to be used, sensing element spacing not to exceed 16”. Provide averaging sensors in all locations where specified or where temperature stratification can occur. Minimum element to be provided, 1 ft. per 2. sq ft of area. Securely support all elements to avoid movement in air stream or long term damage at stress / mounting locations. Supports shall provide radius bend support and insulation to avoid thermal bridging.

3. Well Sensors:

a. Liquid immersion sensors shall have a stainless-steel probe and a stainless steel or brass well. Length of the sensor well shall be selected based on the diameter of the pipe to provide accurate, reliable sensing of the liquid temperature.

4. Outside Sensors:

a. The sensing element shall mounted inside a ventilated, treated, sun shield to minimize the radiant energy and wind effects. Sensor location shall be selected to minimize effects from sunlight, building heat, exhaust systems, etc. Temperature Controls Contractor shall be responsible for selection of an appropriate location. Where sensor location is determined to be adversely affected by outdoor conditions, this contractor shall relocate the sensing devices to a more reliable position.

2.4 THERMOSTATS

A. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

B. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

2.5 HUMIDITY SENSORS

A. Duct and room sensors shall have a sensing range of 20%-80%, minimum accuracy of +/-2% over this span.

B. Outdoor air humidity sensors shall have a sensing range of 20%-95% RH, minimum accuracy of 2% over this span, and shall be suitable for ambient conditions of 0°F-140°F.

C. Humidity sensors shall not drift more than 1% of full scale annually.

D. Temperature compensation of RH reading.

E. Two-year warranty from date of installation.

2.6 FLOW SWITCHES.

A. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service). Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

B. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

C. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.7 RELAYS

A. Control Relays. Control relays shall be UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

B. Time Delay Relays. Time delay relays shall be solid-state, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

2.8 OVERRIDE TIMERS

A. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

2.9 CURRENT TRANSMITTERS

A. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500-ohm maximum burden.

B. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

C. Unit shall be split-core type for clamp-on installation on existing wiring.

2.10 CURRENT TRANSFORMERS

A. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

B. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

C. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

2.11 VOLTAGE TRANSMITTERS

A. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

B. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500-ohm maximum burden.

C. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

2.12 VOLTAGE TRANSFORMERS

A. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

B. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

C. Windings (except for terminals) shall be completely enclosed with metal or plastic.

2.13 POWER MONITORS

A. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

B. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

2.14 CURRENT TRANSDUCER / EQUIPMENT INTERFACE RELAY

A. Low voltage, single phase:

1. Combined status sensor, command relay, and hand-off-auto switch.

2. Sized for monitor and control of small motors.

3. Field selectable relay output.

4. High and low voltage isolation.

5. Industrial grade load switching relay.

6. Mountable on single or double gang boxes, flush on starter enclosures, or stand-alone.

7. Approved for installation in the following environmental conditions:

a. 0-95% RELATIVE HUMIDITY, NON-CONDENSING.

b. –15° TO 60° C

8. Design equipment: Veris Hawkeye H500.

9. Alternative components combining the total functionality of the specified device may be submitted for approval.

2.15 PRESSURE TRANSMITTERS

A. Pressure transmitters shall be of 2-wire, 4-20 mA / 0-10vdc output type with a capacitance element having an accuracy of +/- 1% over the entire range. Transmitter shall include protection against reverse polarity and supply voltage transients. Accuracy and zero span adjustment shall be provided with each transmitter to allow for recalibration as necessary.

1. Liquid Pressure

a. The operating range shall be -40.0 to 176.0 F.

b. Safe overpressure shall be a minimum of 150% of the rated pressure.

c. Sensor range to be selected so anticipated control setpoint resides in the middle third of the sensor span.

d. Use of two discrete pressure sensors and mathematical determination of system differential pressure is acceptable.

e. Differential pressure sensor shall use a five-valve manifold to allow proper service and removal of air from the sensing lines without damage. Locate such that the lines from the primary piping can be properly drained and vented. Provide isolation at the mains to allow service to the assembly.

f. Shall be contained in an aluminum NEMA-1 enclosure.

2. Air Pressure

a. The operating range shall be -40.0 to 176.0 F.

b. Safe overpressure shall be a minimum of 150% of the rated pressure.

c. Sensor range to be field selectable so anticipated control setpoint resides in the middle third of the sensor span.

d. Sensor shall have local readout.

e. Sensor shall be equipped with reverse polarity protection.

f. Sensor shall have ability for field zero of reading and output.

g. Shall be contained in an aluminum NEMA-1 enclosure.

h. Not to be provided when Space Pressure Monitor (SPM) / Room Pressure Monitor (RPM) is specified or called out on the drawings.

i. Sensor warranty shall be 3 years.

j. Design Make – BAPI ZPS series

2.16 DIFFERENTIAL PRESSURE SWITCHES

A. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

2.17 FLOW TRANSMITTERS

A. Airflow – Acceptable for all applications

1. Duct mounted airflow measuring station shall consist of one or more airflow/temperature measuring devices based on size of duct and all required electronics. The complete system shall be factory tested prior to shipment. The airflow measuring station shall not require calibration over the life of the equipment.

2. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans without prior approval by the Engineer.

3. Each sensing point shall measure both airflow and temperature using a pair of instrument grade, hermitically sealed, glass encapsulated thermistors, one self-heated and one ambient temperature. Airflow rate sensing device shall utilize thermal dispersion technology. Individual sensor notes shall be individually calibrated at 16 points to NIST calibration standards. Sensors will read and system will compensate for air temperature and impact on velocity or CFM. Provide copy of NIST calibration report for the reference standard to calibration the production tunnels used to calibrate individual sensor nodes. Devices claiming AMCA certification are not acceptable.

4. Provide air flow measuring station transmitter including any 24 VAC transformer to interface with the BAS. Each measurement location shall produce a single, separate linear analog output signal for airflow and temperature where indicated, both of which can be directly interfaced to the BMS.

5. The system shall have the ability to perform self-diagnostics and produce an alarm, which can identify the source of malfunction. In the event of a sensor failure, the system shall ignore failed sensor(s), average remaining sensors and shall continue to operate.

6. Sensor range shall be minimum and maximum system airflow rates with an accuracy of ±2%. Sensors and electronics shall operate over a temperature range of -20° F to 120° F, acceptable for use over a range of 5-95% RH, non-condensing. Size for 125% of anticipated range of air flow. The number of independent sensing points shall be per manufacturer's recommendations for the specified application as shown on drawings.

7. Remote transmitters to be mounted in a location protected from moisture. Provide weatherproof enclosure and mount away from direct sunlight when outdoor mounting is required.

8. The probe body shall be constructed of extruded anodized aluminum alloy.

9. Provide a Bluetooth and Android/IOS software that allows real time airflow and temperature monitoring.

10. Provide required length of cable to location of adjacent transmitter station to be mounted in an accessible, convenient location for operator use. Prior to start-up, a factory trained representative shall visit the site to inspect installation of air flow measuring devices and wiring. A written report shall be submitted to the engineer for the start-up services.

11. Acceptable Make: Ebtron, Air Monitor

B. Fan Array and Single Fan Measurement.

1. For use only where specifically called for or approved in advance by the Engineer

2. Each AMD shall be suitable for installation in fan inlets to determine the airflow rate and velocity weighted temperature of the airstream. Piezo rings are not acceptable.

3. Each sensing point shall measure both airflow and temperature using a pair of instrument grade, hermitically sealed, glass encapsulated thermistors, one self-heated and one ambient temperature. Airflow rate sensing device shall utilize thermal dispersion technology. Individual sensor notes shall be individually calibrated at 16 points to NIST calibration standards. Sensors will read and system will compensate for air temperature and impact on velocity or CFM. Provide copy of NIST calibration report for the reference standard to calibration the production tunnels used to calibrate individual sensor nodes. Devices claiming AMCA certification are not acceptable.

4. Provide face, forward mount adjustable brackets for each sensor node. Mount styles shall not affect the airflow or sound performance of plenum fans.

5. Provide air flow measuring station transmitter including any 24 VAC transformer to interface with the BAS. Each measurement location shall produce a single, separate linear analog output signal for airflow and temperature where indicated, both of which can be directly interfaced to the BMS.

6. Provide the following number of sensor nodes based on fan type. All sensors shall be connected to a single, remote transmitter. Fan array models shall calculate the airflow of each fan individually prior to outputting the total airflow rate and have a built-in alarm capable of removing a failed fan from the total airflow calculation.

   a. SWSI fans – Two

   b. DWDI Fans – Two per inlet

   c. Fan Arrays – One per inlet

C. Liquid Flow

1. Insertion Type - Onicon F3500 or approved equivalent only

2. Install in compliance with all manufacturers requirements.

3. Provide type as specified on the contract drawings.

D. Remote Readout Unit:

1. Provide only where specified or shown on the drawings.

2. Able to accept signals from meter, temperature transmitter and pressure transducer.

3. Shall provide local display of actual flow rate, totalized flow (counter), and percent of full flow.

4. Shall provide a 4-20 mA DC analog signal to read actual flow and totalized flow at DDC controller.

5. 115V or 230V AC operation (+ 15%).

6. Provide in NEMA 4 enclosure. Mount on adjacent wall.

2.18 CO2 SENSORS

A. Space

1. Provide only where specified or shown on the drawings.

2. Dual Channel optical system for reference calibration

3. Optional temperature sensing – coordinate with zone requirements

4. 90% response time inside of 45 seconds at 25°C.

5. Local LCD display of CO2 concentration

6. Temperature and altitude compensation

7. 0-10v or 4-20 ma output

8. Accurate to within 50ppm between 400 and 2000ppm

9. Drift not to exceed 20ppm / year.

10. Eighteen-month warranty from installation date

B. CO2 Sensors – Duct

1. Provide only where specified or shown on the drawings.

2. Dual Channel optical system for reference calibration

3. 90% response time inside of 45 seconds at 25°C.

4. Temperature and altitude compensation

5. 0-10v or 4-20 ma output

6. Accurate to within 50ppm between 400 and 2000ppm

7. Drift not to exceed 20ppm / year.

8. Eighteen-month warranty from installation date

2.19 ENCLOSURES

A. Enclosures shall be NEMA-1 rated steel, finished to control oxidation in a highly humid atmosphere.

B. Each enclosure shall have a hinged door with handle and keyed lock

C. Shall provide 40% of free space for future expansion of the system.

2.20 DAMPER MOTORS

A. Electronic:

1. Electronic actuators shall be driven directly by 0-10 VDC, supply power: 24 VAC or 30VDC, as acceptable to its controller, and provide adequate torque to meet the application.

2. Where actuators over 30vdc requirement are supplied, coordinate with furnishing contractor for all wiring requirements in compliance with NEC and these specifications.

3. Electronic actuators shall be direct-coupled type.

4. For all actuators, assure execution of the fail-safe position in case of the Freezestat trip or power loss.

5. Actuators to be sized for smooth operation over entire range and a minimum of 150% of required torque for connected components.

6. Design Make: Belimo, Neptronic.

2.21 CONTROL DAMPERS

A. Rectangular;

1. Blades are extruded aluminum profiles. Aluminum end caps are press fitted to blade ends in order to seal hollow interior and reduce air leakage rates.

2. Blade and frame seals are extruded silicone and are secured in an integral slot within the aluminum extrusions.

3. Bearings are composed of a celcon inner bearing fixed to a 7/16" (11.11mm) aluminum hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.

4. Linkage hardware is installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

5. Dampers are designed for operation in temperatures ranging between -40°f (-40°c) and 212°f (100°c).

6. Dampers are available with either opposed blade action or parallel blade action.

7. Leakage class 1a at 1” w.g. Static pressure differential. Standard air leakage data is certified under the amca certified ratings program.

8. Two position dampers - pressure drop not to exceed 0.2”wc as installed. If frame is fully within the duct, the pressure drop calculations shall account for this installation method.

9. Modulating control dampers shall be sized by the temperature control manufacturer. Maximum velocity shall be 1500 fpm and maximum pressure drop shall be 0.15 in w.g, not to exceed 0.2”wc. Dampers shall be of adequate authority and sized and positioned to allow for smooth modulation of controlled air streams.

10. Damper pressure drops shall take into account the as-installed position and be certified for pressure drop per amca standard 500-d.

11. Dampers are available in two mounting types: i.e., "installed in duct" or "flanged to duct".

12. Provide thermally broken frame design where use of standard frame could cause condensation or operational issues.

13. Installation of dampers shall be in accordance with current manufacturer’s installation instructions.

14. Dampers over 48 in. In length and height shall be made into multiple sections.

15. Automatic dampers are required at all exterior walls and roof openings. Dampers to open when respective fan starts. Dampers at exterior walls and roof openings shall be insulated blade, thermal break design.

16. Design make: tamco 1500 series (standard), tamco 9000 series (outdoor air intake and exhaust / relief locations)

B. Round

1. Temperature rating: withstand maximum of 250 degrees f.

2. Minimum diameter 4 inches. Maximum 48 inch.

3. Capacity: damper shall withstand hvac system operating conditions:

4. Closed position: maximum pressure of 10 inches w.g @ a 6 inch diameter.

5. Open position: maximum air velocity of 4,000 feet per minute.

6. Leakage: provide with damper blade seals. Maximum 10 cfm at 4 inches w.g. For 48 inch diameter damper.

7. Pressure drop: maximum 0.1 inch w.g at 1,000 feet per minute

8. Frame: under 6 inch diameter; 2 inch x 12 gauge steel tube. 6 thru 12 inch, 2 inch x 0.5 inch x 14 gauge steel channel. Above 12 inch thru 24 inch, 2 x 0.5 x 1/8 inch steel channel. Above 24 inch; 2 x 1 x 3/16 inch steel channel.

9. Blade style: single skin round blade.

10. Material: diameter 18 inch or under; 12 gauge steel. Diameter over 18 inch; 10 gauge steel (3.5 mm). Stiffeners as required.

11. Bearings: stainless steel pressed into frame.

12. Seals: neoprene ring.

13. Axles: diameter 24 inch or under; 0.5 inch diameter plated steel. Diameter over 24 inch); 0.75 inch plated steel.

14. Actuation: refer to damper actuators paragraph. Provide actuator mounting plate and extended shaft where required to allow proper insulation of duct insulation and damper actuator. Direct mount of actuator anti-rotation pin to the ductwork is not permitted.

15. Design make: ruskin cdr25

2.22 CONTROL VALVES

A. General:

1. Valves shall be applicable for the rated pressure and temperature service. Close off pressures must be determined in concert with the actuators and valves shall be provided to close off against extreme anticipated conditions. Valves shall be selected such that they are not, as a practice, "oversized."

2. Modulating valves shall be carefully selected to control in a smooth and stable fashion across the range of anticipated conditions. "Split ranging" of heating and cooling valves controlled by the BMS is not acceptable. A separate output from the BMS shall be provided for all control valves. When the selection criteria indicated below are not met, flow characteristic analyses shall be submitted to demonstrate reasonable correlation between stroke and flow.

3. Modulating actuators for Primary Equipment (air handlers, etc.) shall be selected for smooth actuation over the entire operating range, use a 24vac power supply, and respond to an electronic input of: 4-20 mA or 0-10 VDC.

4. Actuators using "floating point" (bi-directional) for positioning shall be permitted on VAV box dampers and VAV reheat valves. Additional applications may be permitted with advance permission by the Engineer.

5. Pulse Width Modulation (PWM) actuators will be permitted on small unitary equipment, such as fan coils or other systems less than 1200cfm in size, but under no circumstances for use in control of outdoor air economizers or control valves greater than 1" in size. Additional applications may be permitted with advance permission by the Engineer.

B. Provide factory fabricated control valves with operators as required by this specification. Provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with specified maximum pressure drop across control valve. Equipment control valves with heavy duty actuators, with proper shut off rating for each individual application.

C. Valves shall be selected to perform as specified taking into account inlet and outlet piping geometry correction factors. Temperature control contractor shall instruct mechanical contractor on correct installation technique and verify that installation matches manufacturer's requirements for proper performance.

D. Design Pressure Drop –

1. Water Service Valves - Unless specified to the contrary, valves shall be selected for a pressure drop approximately equal to that of the connected equipment, but no greater than 5 psi or less than 3 psi at design water flow.

E. Single Seated Valves:

1. Cage type trim, providing seating and guiding surfaces for plug on “top and bottom” guided plugs.

2. Valve Trim and Stems: Polished stainless steel.

3. Packing: Dual O-Ring up to 1 ½”, Spring-loaded Teflon, self-adjusting 2” and up.

4. Bodies, 2" and Smaller: Bronze with screwed end connections, replaceable brass seat. 125 psig rated, minimum

5. Bodies, 2 1/2" and Larger: Cast iron with flanged end connections, replaceable brass seat. 125 psig rated, minimum.

F. Ball Valves:

1. Modulating water valves shall be ball valves with an equal percentage characteristic.

2. Type: Two or three-way as called for, V-port ball valve with characterizing disk, 1/4 turn.

3. Packing: EPDM O-rings, lubricated.

4. Ball & Stem: Stainless steel.

5. Seat: Fiberglass reinforced Teflon.

6. Actuator: Electric, one motor only; valves 4 inches and larger shall have single operator.

7. Flow Characteristic: Equal percentage.

G. Actuator: Electric, one motor only

1. Failure positions shall generally be as follows, contact owner for special circumstances requiring deviation from these requirements:

   a. Terminal hot water radiation: fail last

   b. Fan Coil Unit cooling coils: normally closed spring return

   c. Pre-Heat coils in air handling units: normally open spring return

2. Input signal: 0-10 VDC, equipped with spring failure position return all heating applications. “Floating point” actuation allowed only where specifically noted elsewhere in the contract documents.

3. The Back-to-back electronic actuations, i.e., where two identical actuators are engaged in operating the rising or rotation of valve stem are not permitted.

4. Valve Closeoff:

   a. Water – 120% of total system (pump) head.

   b. Steam – 200% of system operating (inlet) pressure.

   c. Valves to be used on this project shall be suitable for complete closeoff to the levels stated under modulating duty. In the event that manufacturer's data provides a separate maximum differential pressure under modulating duty, both criteria shall exceed the above requirements.

2.23 SAFETY/STATUS DEVICES

A. Low Limit Detector ("freezestat"): Electric type, with manual reset and auxiliary contacts to the DDC, set for 37°F for "freeze" protection and 55°F for fan discharge application. Provide a 20' long element for every 25 sq. Ft. Of coil face area or fraction thereof. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

B. High Limit Detector ("firestat"): Electric type, with manual reset and auxiliary contacts to the DDC, UL Listed for fire, set for 180°F.

C. Pump status through adjustable range current sensing element on pump motor. Calibrate to actual conditions.

D. Fan status through adjustable range current sensing element on the fan motor. Calibrate to actual conditions.

2.24 COMMUNICATIONS

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2016, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

D. Internet operator interface and value passing shall be transparent to network architecture.

   1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

E. System shall automatically synchronize system clocks daily from an operator-designated controller via the network. If applicable, system shall automatically adjust for daylight saving and standard time.

F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.25 OPERATOR INTERFACE

A. All operator workstation functions shall be updated on the existing operator workstation(s) to reflect the new equipment and systems installed under this project.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135-2016, BACnet.

C. Hardware. Each newly provided workstation or web server shall consist of the following:

1. Industry-standard hardware of current manufacture meeting or exceeding ddc system manufacturer's recommended specifications and shall meet response times specified.

2. Hard disk shall have sufficient memory to store system software, one year of data for trended points, and a system database at least twice the size of the existing database at system acceptance, minimum 500gb total.

3. Minimum 16gb ram

4. Workstations shall be microsoft windows 10 /11 compatible.

5. Provide all necessary communication ports for a complete operating system, with the following additional minimum requirements

a. 10/100/1000 Ethernet

b. USB-A / USB-C (minimum 4 ports)

c. DVI

d. Minimum 24” monitor

e. Network communication ports and cables required for proper system operation

D. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.

2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, pid gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.

8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.

9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

E. System Software

1. Operating System. Workstation server shall operate on Microsoft Windows 10.

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

    a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.

    b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.

    c. Alarm indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

    d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

    e. Provide a link from each piece of graphically represented equipment to the associated wiring diagram and sequence of operation.

F. System tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. Operators shall be able to configure the system.

4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

5. Security. System shall require a user name and password to view, edit, add, or delete data.

    a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.

    b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

    c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

11. Trend Configuration. Operator shall be able to configure trend sample or change of value interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk.

12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

14. Standard Reports. Furnish the following standard system reports:

    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.

    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        1) Alarm History.

        2) Trend Data. Operator shall be able to select trends to be logged.

        3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

16. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

17. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language (or block language equivalent) shall have the following features:

    a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.

    b. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

c. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

d. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

e. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

2) System Variables. Operator shall be able to use predefined variables to represent status and results of controller software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

2.26 CONTROLLER SOFTWARE

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. Scheduling. System shall provide the following schedule options as a minimum:

1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule, has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.

3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

C. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

D. Alarm Reporting.

E. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms.

F. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits.

G. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

H. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

I. Startup Optimization – All equipment noted in the sequences of operation to have scheduled operation shall be started on an optimized basis which attempts to reach occupied conditions just prior to the scheduled occupancy time.

J. Pressure control optimization – All equipment noted in the sequences of operation (fans and pumps) shall have reset of pressure control setpoint initiated in the sequence. Typically, for pumps this would cause the software to examine all connected control valves for position, determine the critical valve (defined as the valve at the highest demand position), and reset the pressure setpoint up or down to maintain the critical valve between 80 and 90% open. For fans serving zone air valves / VAV boxes, this would similarly reset the duct pressure setpoint to maintain the critical zone damper between 80 and 90% open.

K. Heating Water Pump Control – Whenever heating demand reaches a minimum controllable threshold; the heating pumps shall be disabled and the heating water system shut down until demand for heating / reheat reaches a controllable level. This shall apply only in non-critical environment, exclusions apply to medical and laboratory application.

L. Energy Calculations.

1. System shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.

2. System shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.

M. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

N. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

O. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified.

2.27 CONTROLLERS

A. General. Provide controllers and accessory devices as required to achieve performance specified.

B. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2016, and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

6. BACnet Communication.

a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.

c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2. Signal Management – Master or Global Controller operating systems shall manage input and output communication signals to allow distributed controllers (lower level networks) to share real and virtual object information and to allow for central monitoring and alarms.

3. Data Sharing. Each Master or Global Controller shall share data as required to allow the specified performance and sequence of operation.

4. Stand-Alone Operation. Each piece of equipment specified shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

F. Serviceability

1. Controllers shall have diagnostic LEDs for power, communication, and processor.

2. Wires shall be connected to a field-removable modular terminal strip or to a termination card to allow service without rewiring the controller.

3. Each controller shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

G. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 hz and from keyed radios up to 5 W at 1 m (3 ft).

H. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.28 INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to all controller hardware.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.29 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

a. Dielectric strength of 1000 V minimum

b. Response time of 10 nanoseconds or less

c. Transverse mode noise attenuation of 65 dB or greater

d. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.30 REFRIGERANT DETECTION SYSTEM

A. Provide a complete installation of a refrigerant leak detection system including a main control panel, sensors and audible/visual alarm devices and emergency break glass switches that are linked to a Building Automation System (BAS).

B. The gas detection system(s) shall be as indicated on the project documents, point list(s), drawings and as described in these specifications. The scope of work shall include a complete and working system including all engineering, programming, controls, and installation materials, commissioning, start-up, training, and final project documentation and warranty.

C. The system shall include, but not be limited to, the following:

1. Future expandability.

2. Display of refrigerant gas concentration.

3. Ability to modify alarm set points.

4. Daisy-chain capability.

5. Automatic and manual fan start/stop.

6. Display of alarm status.

D. The refrigerant leak detection system design shall consist of diffusion type sensors and a control unit. Sample draw systems with sample tubing are unacceptable.

E. Power for gas detection control panels shall come from designated panels on the electrical drawings. Wiring shall be by this contractor, panel breaker to be supplied by the Electrical Contractor.

F. Coordinate all work with Division 26, “Electrical”.

G. Provide control system to operate HVAC equipment in response to gas detection levels as per the sequence of operation. Provide interface with Building Automation System to control operation of HVAC equipment in response to gas detection levels as per the sequence of operation in Section 230923.

H. Warranty

1. Warranty for the entire gas detection system shall commence upon completion of the system commissioning as specified. The warranty includes fine-tuning of all dynamic elements of the gas detection system to achieve reasonable, efficient and protection and operation.

2. Provide a one-year warranty on all controllers.

3. Provide a one-year warranty on all other components.

4. Disclose to Owner and accommodate longer warranty periods if provided by components manufactured at the time of purchasing.

I. Detectors

1. Operating Principal: the principal of operation shall be non-dispersive infrared technology. Detector and associated monitoring system shall be continuously operating and monitoring for the specific refrigerant used in the chiller system or stored.

a. Detector sample: The detector shall be of diffusion type with no internal sample pump or filter.

b. Detector sensitivity: The detector shall be capable of monitoring over a range of 0-1000 ppm with a resolution of 1 ppm.

c. Detector accuracy: The detector shall be capable of maintaining a response of ±8% @ range of 500 ppm.

d. Temperature: The system shall operate over a range of 32ºF to 104 ºF.

e. Environmental conditions: The system shall be compatible with the humidity, barometric pressure and voltage fluctuation of the operating environment.

f. Stability: The 30 day zero and span drift shall be less than 1% F.S. without the aid of automatic or manual recalibration. The system shall not employ any type of auto-zero techniques in order to maintain stability. The use of fresh air sources or scrubbers as zero reference is not permitted.

g. Calibration – The system must provide a menu driven method of checking both zero and span calibrations. Any adjustments must be made through the front panel keyboard.

h. Maximum distance between the sensor and controller shall not exceed 200 ft.

i. Mximum System Maintenance Requirements – The detectors shall require no periodic maintenance other than yearly zero and span checking with calibrated zero and span gas. Periodic checking or adjustments of the unit shall be capable of being accomplished by one person at the unit location.

j. The detectors shall be located where the refrigerant is used and/or stored in accordance with the parameters listed below. The alarms shall be activated in accordance with the following parameters:

TOXIC GASES	1ST ALARM SETPOINT (TLV-TWA)	2ND ALARM SETPOINT (TLV-STEL)	3RD ALARM SETPOINT	MOUNTING HEIGHT	COVERAGE
REFRIGERANTS	250 PPM	500 PPM	900 PPM	1 FT. AFF	1 PER CHILLER EQUIPMENT ROOM

J. Accessories:

1. Strobe & horn (for refrigerant detection system): strobe and horn may be integral to the controller or remote mounted. The remote mounted unit shall be rated at 85dba at 10 ft. The integral horn strobe unit shall be rated at 90dba at 3 ft.

2. Emergency break glass switches (for refrigerant detection system): provide emergency break glass manual switches.

3.0 PART 3 - EXECUTION

3.1 WIRING

A. All wiring shall comply with these specifications, Specification Section 230514, and the NEC. Deviations are only permitted where manufacturer's requirements specifically conflict with gauge and wiring type specified within this section.

B. Communication wiring shall be installed using the particular system recommended, plenum rated, jacket shielded cable. The communication network wiring shall be clearly marked with a specific color code. Communication wiring shall not be installed near noise producing equipment, such as ballasts, magnetic starters, etc. Communication wiring shall comply with the optimum requirements necessary to assure communication integrity and speed.

C. All analog inputs and analog outputs shall be wired using 18 gauge stranded shielded cable. All Analog inputs and analog outputs wiring shall not be installed near noise producing equipment, such as ballasts, magnetic starters, etc.

D. All digital outputs shall be wired using 18 gauge stranded wire.

E. All wiring in mechanical rooms, walls shall be installed in EMT conduit. Concealed conduit and wiring is required in all finished spaces.

F. Power Supplies

1. Transformers – Each w/ low voltage fuse holder/disconnect

2. Actuators and relays shall use separate transformers from those powering microprocessor control panels.

3. Transformers shall be sized for a minimum of 150% of the connected load.

4. Convenience Outlet –

    a. 110vac combination outlet w/ switch to kill 110vac to panel

5. Switched 110vac to panel is fused before transformers (after outlet).

6. Provide at all control panels excepting those for terminal equipment (exclude reheats, cabinet heaters, fan coils, etc.)

7. Wiring Panduit

    a. Wire ducts around exterior of panel for cables entering panel

    b. Wire ducts as necessary to route hookup wires from terminals to controllers and other devices

8. Panel Construction (sized to provide 25% future expansion w/ removable back panel)

   a. Indoors – Johnson M8100 series

   b. Outdoors – Hoffman fiberglass Nema 4x

9. Wire Labeling

   a. All DDC system wiring shall be individually labeled and permanently tagged at both ends of the conductors, including within all junction boxes between panels.

   b. All submittal and as-built drawings shall reflect the field installed wire tag numbers.

   c. All wire numbers shall be unique throughout the system installation.

3.2 DDC EQUIPMENT

A. All components shall be installed in protective enclosures. All wiring within the DDC enclosure shall be number coded. Both the enclosure and the controller shall be properly grounded in accordance with manufacturer's recommendation. Documentation shall be firmly attached to the enclosure within a plastic envelope. Documentation shall state point-to-point termination detail, description of each individual point, location of power source for the controller and ID number or address within the network.

B. All DDC Controllers shall be mounted on walls within equipment rooms, custodial closets or electrical rooms. Only application-specific controllers for rooftop units or package units may be mounted on the equipment.

3.3 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate work of others. Temperature Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.4 PROTECTION

A. Temperature Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. Temperature Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.5 COORDINATION

A. Site.

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Test and Balance.

1. Furnish Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing for the duration of TAB activity

2. Train Test and Balance Contractor to use control system interface tools.

3. Provide a qualified technician to assist with testing and balancing of all air handling equipment and terminal units.

4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

C. Life Safety.

1. Duct smoke detectors required for air handler shutdown are furnished and installed by others. Interlock smoke detectors to air handlers for shutdown as specified Sequence of Operations for HVAC Controls.

2. Smoke dampers and actuators required for duct smoke isolation are furnished and installed by others. Interlock smoke dampers to air handlers as specified in Sequence of Operations for HVAC Controls.

D. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.

1. Each supplier of a controls product shall configure, program, start up, and test that product to meet the required sequences of operation regardless of where within the contract documents those products are described.

2. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.

3. Temperature Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.6 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

B. Independently support all temperature control wiring from other systems. Do NOT support from conduits, piping or hangers for equipment.

C. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

D. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.

E. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.

F. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.7 FIELD QUALITY CONTROL

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances.

B. Continually monitor field installation for code compliance and workmanship quality.

C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.8 COMMUNICATION WIRING

A. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

B. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

C. Verify entire network's integrity following cable installation using appropriate tests for each cable.

D. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

E. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

F. Label communication wiring to indicate origination and destination.

3.9 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing. Where sensor locations can be effected by wall surface temperature, pack junction box with insulation and provide insulated back plate for sensor. Install all space sensors so they are not affected by direct sunlight, appliances / equipment, or air currents. Consult with the Engineer prior to installing device if the location shown on the project drawings does not meet these criteria.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas. Use of Silicon or similar sealant is prohibited. Use Fiberglass or poly fill in the junction boxes.

E. Use averaging sensors in mixing plenums and hot and cold decks, and all duct locations which may be subject to stratification. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a mechanically fastened capillary clip. “Stick on” type fasteners are specifically prohibited.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a mechanically fastened capillary clip. “Stick on” type fasteners are specifically prohibited.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells. Sensors and wells shall be installed to assure that the entire sensing element is completely immersed in the measured media with minimal pressure drop. Provide oversized pipe section, oversized elbow, or other recognized method to achieve this result in compliance with this specification and manufacturer’s recommendations.

H. Install outdoor air temperature sensors on north wall with sun shield. Sensor to be located where thermal characteristics of the building and solar load do not effect readings.

I. All sensors to be mounted on externally insulated ductwork or plenums shall be provided with standoff brackets. Insulation and vapor barriers shall be carried continuously beneath the sensor enclosure. Coordinate installation with mechanical and insulation contractors.

J. Differential Air Static Pressure.

1. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

2. Air pressure transducers shall be located in control panels, not on monitored equipment or on ductwork. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.

3. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

K. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status. Interlock shall be provided such that the unit cannot be restarted in either hand or auto modes without manual reset of the safety device.

3.10 FLOW SWITCH INSTALLATION

A. Use correct paddle for pipe diameter.

B. Adjust flow switch according to manufacturer's instructions.

3.11 FLOW TRANSMITTER INSTALLATION

A. Airflow and Liquid Flow

1. Provide meter probe size, type and arrangement per manufacturers recommendations to obtain accuracy and performance specified.

2. Verify calibration of Remote Readout Unit (where specified to be provided) over operating range in conjunction with TAB contractor. Perform all necessary field calibration to obtain readout accuracy within specified limits.

3. Provide specified interface to DDC system.

4. Verify accuracy of DDC system reading against Remote Readout Unit (where specified) and balancer readings over operating range of device.

5. Provide installation in strict compliance with manufacturer’s requirements.

3.12 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.

1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.

2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.

3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

4. Provide necessary mounting hardware and linkages for actuator installation.

C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer.

D. Where actuators are mounted to the side of insulated ductwork or equipment, provide insulation standoffs and repair insulation and vapor barrier.

3.13 WARNING LABELS

A. Affix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.14 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 2 in. of termination.

B. Permanently label or code each point of field terminal strips to show instrument or item served.

C. Label control panels with minimum ½ in. letters on laminated plastic nameplates.

D. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

E. Label room sensors related to terminal boxes or valves with nameplates.

F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

G. Label identifiers shall match record documents.

H. Provide laminated control diagrams in each control panel for each piece of major controlled equipment or system.

3.15 OPERATOR INTERFACE

A. Standard Graphics. Provide graphics as specified. Show on each equipment graphic input and output points and relevant calculated points such as indicated on the applicable Points List / diagram. Point information on graphics shall dynamically update.

B. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation).

C. Provide logical descriptions and engineering units on all data displays. Example: percentage position shall be easily discernable as percent open or closed.

D. Provide logical linking between graphics. For example, direct penetration from building to floor to air handler to air terminal and back is to be provided without need to resort to a menu tree to navigate the building.

E. Graphical user interface shall be reviewed by the Owner and / or Engineer. If in their sole opinion the graphics are inaccurate, incomplete, or improperly represent the systems, the graphics shall be updated as no additional cost to the project.

3.16 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Prior to demonstration and acceptance, the contractor shall:

1. Complete all Pre-Commissioning requirements as described in paragraph 1.11 of this section.

2. Complete system commissioning requirements per section 019113.

3. Correct all deficiencies in control system hardware and software noted in engineer’s punchlists, field observations, and commissioning issues logs / reports.

B. Demonstration. Prior to acceptance, perform the following to demonstrate system operation and compliance.

1. Engineer and / or Owner’s representative will be present to observe and review system demonstration. Notify Engineer at least 10 days before system demonstration begins.

2. Demonstrate actual field operation of sequence of operation. Provide at least two persons equipped with two-way communication (if required). Demonstrate calibration and response of any input and output points requested by Engineer. Provide and operate test equipment required to prove proper system operation. Engineer may, at their discretion, perform these tests on a “spot check” basis.

3. Demonstrate complete operation of operator interface.

4. Demonstrate each of the following.

   a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Engineer will require further tuning of each loop that displays unreasonably under- or over-damped control.

   b. Demand limiting (where applicable). Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand-limiting setpoint, and status of setpoints and other affected equipment parameters.

   c. Building fire alarm system interface.

   d. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation.. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.

5. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

C. Acceptance.

1. After tests described in these specifications are performed to the satisfaction of both Engineer and Owner, Engineer will accept control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control, such as seasonal requirements or construction progress issues. Engineer will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

3.17 REFRIGERANT DETECTION SYSTEM

A. Install the gas detection system complete, including but not limited to sensors, audible alarms, panels, power and control wiring, as indicated in the contract documents, as recommended by the manufacturer of the equipment in the user’s manual and in compliance with local codes and the authority having jurisdiction.

B. Install low voltage control conduit and wiring from sensors to control panel, between control panels, and from control panels to the fan starters/equipment actuators / hvac control panels as per the contract documents and as recommended by the manufacturer of the equipment.

1. Low voltage conduit and wiring are specified in division 26: electrical.

C. For mechanical room applications, provide a control panel within the mechanical room and a remote control panel outside the mechanical room at each entrance.

D. The system shall be installed with strict adherence to the manufacturer's guide lines.

E. Mount sensors where indicated on drawings and in accordance with the table below:

Gas-specific sensor	Mounting height
Refrigerants	1 ft. Aff

F. Gas sensors shall be strategically located throughout the facility/structure as shown on the contract documents. Each detector shall cover a maximum area as indicated in the table below:

Gas-specific sensor	Coverage
Refrigerants	20 ft. / 1250 ft^2

G. Start-up testing

1. The gas detection system shall be inspected and commissioned on site by a factory-trained and authorized technician representing the manufacturer. A factory generated certification document shall be presented certifying the operation of the detection system and the alarm system. A test report shall be submitted to the engineer.

2. Submit six (6) copies of operations and maintenance manuals. Manuals shall be bound with index, tabs, and include the following:

a. Equipment submittals.

b. Operating and maintenance instruction sheets and parts list.

c. Design data sheets.

d. Contact person for more information.

H. Commissioning

1. After installation, test and calibrate equipment by manufacturer's certified service technician to demonstrate operation of functions described above under sequences of operation.

2. Provide testing kits (including gas bottles) for testing and calibration by commission forces.

3.18 CLEANING

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

END OF SECTION 230923

SECTION 232000 - PIPING SYSTEMS AND ACCESSORIES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

B. Provide all chemical treatment required for piping systems each time an individual system is drained and then refilled as a result of work performed under this contract.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit a schedule of pipe materials, fittings and connections by piping system.

B. Submit anchors, sleeves, hanger shields, and guides.

C. Refrigerant piping diagrams.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide domestically manufactured pipe, fittings and accessories.

B. All pipe, tubing and fittings shall be either tested by an approved third party testing agency or certified by an approved third party certification agency.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products in factory-fabricated containers. Deliver pipe and tube with factory-applied plastic end-caps on each length.

B. Store products in original wrapping and protect from dirt and damage. Store piping and tube inside. Where necessary to store outside, evaluate well above grade and enclose with waterproof wrapping.

C. Handle products carefully to avoid damage. Do not install damaged products.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Each length of pipe and each pipe fitting shall be new and marked with manufacturer's name; complying with the following Standards where applicable:

1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

2. American Society of Mechanical Engineers (ASME)

3. American Society of Testing and Materials (ASTM)

4. American National Standards Institute (ANSI)

5. American Water Works Association (AWWA)

6. American Petroleum Institute (API)

7. American Standards Association (ASA)

B. Refer to the MCNYS section 1202 for additional compliance standards for piping and fittings.

2.2 STEEL PIPING AND FITTINGS

A. Pipe: ASTM A53, ASTM A106, Schedule 40 or Schedule 80 weight as specified as Exhibit "A"; black or galvanized finish as specified in Exhibit 'A' or as noted on drawings; ends chamfered for welding or roll grooved for grooved mechanical connections. Galvanizing on piping shall be in compliance with ASTM A123.

B. Fittings: Same material and pressure class as adjoining pipe.

1. Welded fittings: Same weight as adjoining piping, factory forged, seamless construction, butt weld type, chamfered ends, in compliance with ASTM A105, ANSI/ASME B16.9 and MSS SP-43. Socket weld, Class 3000, forged in compliance with ASTM A105 and ASME B16.11. Where branch connections are two or more sizes smaller than main size, "Weldolets", Class 3000, forged, in compliance with ASTM A105, ANSI/ASME B16.9 and MSS SP-97, "Threadolets", Class 3000, forged, in compliance with ASTM A105, ASME B16.11, ANSI/ASME B1.20.1 and MSS SP-97. Sockolet weld type, Class 3000, forged in compliance with ASTM A105, ASME B16.11 and MSS SP-97 where specified in Exhibit 'A'.

2. Screwed fittings: Malleable iron, black or galvanized, as called for in Exhibit 'A' or as noted on the Drawings. Fittings shall be in compliance with ASTM A197, ANSI/ASME B1.20.1 and ASME B16.3. Galvanizing of fittings sha1l be in compliance with ASME A153.

3. Malleable iron fitting shall be Standard Class 150 unless otherwise specified in Exhibit 'A' to be Extra Heavy Class 300.

4. Mitered elbows, "shaped" nipples, and job fabricated reductions are not acceptable unless specifically called for.

C. Flanges, Unions and Couplings:

1. Unions: For sizes 2 in. and smaller - Malleable iron, bronze to iron seat, Class 300 in compliance with ASTM A197, ANSI/ASME B1.20.1 and ASME B16.39, or Class 3000 forged steel, steel to steel ground joint to ASTM A181, ANSI/ASME and B1.20.1. MSS SP-83 as called for in Exhibit 'A'. Galvanizing on the unions sha1l be in compliance with ASME A153.

2. Flanges: For sizes 2-1/2 in. and larger pipe sizes - Welding neck type, forged, in compliance with ASTM A105 and ASME B16.5. Class 150 or Class 300 as called for in Exhibit 'A'.

3. Flange Gaskets: All flange gaskets shall be Flexitallic Thermculite Type 835 Spiral Wound.

D. Cleanouts, gauge and instrument connections, nipples and plugs, for adapting gauges and instruments to piping system shall be IPS brass.

E. Base Elbows:

1. Cast iron or steel type, flange connections; Crane 500 or equivalent. Made from welding elbows, with welded pipe support and steel base. Reducing elbows where necessary.

Elbow Size	Support Size	Base Plate
To 3 in.	1-1/4 in.	6 in. x 6 in. x 1/4 in.
4 in. to 6 in.	2-1/2 in.	8 in. x 8 in. x 1/4 in.
6 in. and larger	6 in.	14 in. x 14 in. x 5/16 in.

2. Anchor bolt holes in each corner of base for securely bolting to floor or concrete base; minimum 3/4 in. bolts.

2.3 COPPER PIPE, SOLDER FITTINGS

A. Tubing (Type K, L or M "pipe"): Hard temper meeting in compliance with ASTM B75 and ASTM B88; Type K, L, M. as called for in Exhibit 'A' or as noted on the Drawings. Soft temper only as called for in Exhibit 'A' or as noted on the Drawings. Plans show copper tube sizes.

B. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast bronze as called for in Exhibit 'A' or as noted on the Drawings; solder end connections; shall meet applicable and applicable ASME B16.22 or ASME B16.18.

C. Fittings (Tees, Elbows, Reducers, etc.): Cast bronze, threaded end connections, in compliance with ASME B16.15 and ANSI/ASME B1.20.1.

D. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast copper alloy drainage fitting (DWV), solder end connections, in compliance with ASME B16.29 or ASTM B23.

E. Unions and Flanges: 2 in. and smaller use unions, solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, 150 lb. swp, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1. For piping 2-1/2 in. and over use flanges, cast copper alloy, companion type, Class 150, in compliance with ASME B16.24.

F. Solder Materials: No-lead solder, using alloys made from tin, copper, silver and nickel.

1. Make: Harris "Stay-Safe 50" and "Bright", Englehart "Silverbright 100", Willard Industries "Solder Safe (silver bearing), Canfield "Watersafe".

2.4 COPPER PIPE AND BRAZED FITTINGS

A. Tubing (Type K, L): Hard temper in compliance with ASTM B75 and ASTM B88. As called for in Exhibit ‘A’ or as noted on the Drawings.

B. Fittings (Tees, Elbows, Reducers, etc.): Wrought copper or cast bronze as called for in Exhibit ‘A’ or as noted on the Drawings; solder end connections; shall meet applicable and applicable ASME B16.22 or ASME B16.18.

C. Unions and Flanges: 2 in. and smaller use unions, solder type, cast copper alloy or wrought copper alloy, metal to metal meeting surface, 150 lb. swp, in compliance with ASME B16.18 or ASME B16.22, ANSI/ASME B1.20.1. For piping 2-1/2 in. and over use flanges, cast copper alloy, companion type, Class 150, in compliance with ASME B16.24.

D. Brazing Materials: Silver Alloy, Airco Sil-4S or Sil-Fos as called for in Exhibit ‘A’ or as noted on the Drawings.

2.5 HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS

A. Tubing: PE4710 resin in compliance with ASTM D3350, cell classification 445574C/E per Plastic Pipe Institute (PPI) TR4. Rated for temperatures up to 230°F and pressures up to 250 psi.

B. Fittings: same as pipe. Butt joint suitable for thermal fusion.

C. Acceptable Make: Nupi or equal.

2.6 REFRIGERANT PIPING, VALVES, FITTINGS, AND RELATED PARTS

A. General. Refrigerant piping, valves, fittings, and related parts shall conform to the requirements of this section and tables 2-12-1 and 2-12-2.

B. Refrigerant piping, valves, fittings, and related parts having a maximum internal or external design pressure greater than 15 psig (103.4 kPa gage) shall be listed either individually or as part of an assembly or a system by a nationally recognized testing laboratory, or shall comply with ASME B31.5 where applicable.

C. Refrigerant Parts in Air Duct. All refrigerant-containing parts of a refrigerating system and joints located in an air duct carrying conditioned air to and from an occupied space shall be constructed to withstand a temperature of 700°F (371°C) without leaking into the airstream.

D. Reuse of Piping Materials on Existing Systems. Reused pipe, fittings, valves, or other materials on existing refrigerant systems being renovated or modified shall be clean and free of foreign materials and shall comply with the requirements of this section.

E. Piping Materials Standards. Pipe or tube utilized as refrigerant piping shall either be listed or demonstrate conformance to one or more of the standards in Table 2-12-1. The exterior of the piping shall be protected from corrosion and degradation.

F. Type F Steel Pipe Limitation. ASTM A53/A53M, Type F steel pipe shall only be permitted for discharge lines in pressure relief systems.

G. Pipe Fittings. Refrigerant pipe fittings shall be approved for installation with the piping materials to be installed and shall demonstrate conformance to one or more of the standards in Table 2-12-2 or shall be listed as complying with UL 207.

H. Copper Field Swaged. The minimum and maximum cup depth of field fabricated copper swaged fitting connections shall be constructed in compliance with table 9-10 of the 2022 Revision of ASHRAE Standard 15.

I. Flexible Connectors, Expansion and Vibration Compensators. Flexible connectors and expansion, vibration control devices or other similar components shall be listed to UL 207 or CSA C22.2 No.140.3 for the specific refrigerant of the refrigerating system for which the components are installed, and shall have design pressure in accordance with Section 9.2 of the 2022 Revision of ASHRAE Standard 15.

J. Joints and connections

1. Listed or approved type, limited to those permitted within table 9-11 of the 2022 Revision of ASHRAE Standard 15,

2. Tight for the pressure of the refrigerating system when tested in accordance with Section 9.13 of the 2022 Revision of ASHRAE Standard 15.

3. Joints Between Different Piping Materials. Joints between different piping materials shall be made with listed or approved adapter fittings. Joints between dissimilar metallic piping materials shall be designed to prevent galvanic action, which includes (but is not limited to) the use of a dielectric fitting or a dielectric union conforming to dielectric tests of ASSE 1079.

Table 2-12-1 Refrigerant Piping Materials

Piping Material	Standard
Aluminum tube	ASTM B210/B210M [22], ASTM B491/B491M[23]
Brass (copper alloy) pipe	ASTM B43 [24]
Copper pipe	ASTM B42 [25], ASTM B302 [26]
Copper tube	ASTM B68 [27], ASTM B75 [28], ASTM B88 [29], ASTM B280 [30], ASTM B819 [31]
Copper linesets	ASTM B1003 [32], ASTM B280 [30]
Stainless steel pipe	ASTM A312/A312M [33]
Stainless steel tube	ASTM A269/A269M [34], ASTM A632 [35]
Steel pipe	ASTM A53/A53M [18], ASTM A106/A106M [36], ASTM A333/A333M [37]
Steel tube	ASTM A254/A254M [38], ASTM A334/A334M [39]

Table 2-12-2 Refrigerant Pipe Fittings

Fitting Material	Standard
Aluminum	ASTM B361 [40], ASME B16.52 [41]
Brass (copper alloy)	ASME B16.15 [42], ASME B16.24 [43]
Copper	ASME B16.15 [42], ASME B16.18 [44], ASME B16.22 [45], ASME B16.26 [46], ASME B16.50 [47]
Stainless steel	ASTM A403/A403M [48], ASME B16.11 [49]
Steel	ASTM A105/A105M [50], ASTM A181/A181M [51], ASTM A193/A193M [52], ASTM A234/A234M [53], ASTM A420/A420M [54], ASTM A707/A707M [55]

2.7 HANGERS, INSERTS AND SUPPORTS

A. Hangers, Inserts, Clamps: Carpenter and Patterson, Central Iron, Fee and Mason.

B. Hangers:

1. Adjustable, wrought malleable iron or steel. Copper plated coated where in contact with copper piping. Cadmium plated or galvanized for exterior.

2. Adjustable ring type where piping is installed directly on hanger for piping 3 in. and smaller.

3. Adjustable steel clevis type for piping 4 in. and larger, and where insulation passes through hanger.

4. Hangers sized to permit passage of continuous insulation through the hanger.

5. Nuts and rods with electroplated zinc or cadmium (0.005 in. minimum) finish.

C. Hanger Shields:

1. Pre-insulated type:

a. Insulated pipes shall be protected at point of support by a 360° insert of high density, 100 psi waterproofed calcium silicate, encased in a 360° sheet metal shield. Insulation insert to be same thickness as adjoining pipe insulation and extend 1 in. beyond sheet metal shield.

2. Field-insulated type:

a. #18 USSG, galvanized steel shields, minimum 120° arc. Provide temporary blocking between pipe and hanger to maintain proper spacing for insulation. Provide at all support points.

3. Shield Sizing:

Pipe Size	Shield ID (1 ½" insulation)	Shield Length	Minimum Gauge
Up to 3-1/2"	Up to 6.5"	12 in.	18
4"	7"	12 in.	16
5" and 6"	8" and 9"	12 in.	14
8" to 14"	11" to 17"	24 in.	12
16" to 24"	19" to 27"	24 in.	10

a. Hanger shield gauges listed are for use with band type hangers only. For point loading (roller support), increase shield thickness by one gauge, and length by 50%.

D. Spacing Schedule: Hanger spacing shall be per the following tables. For alternate materials and sizes not listed herein, refer to the MCNYS, Section 305

Pipe Size	Steel	Copper	PVC Plastic	Rod Size
½ to 1 in.	8 ft.	6 ft.	3 ft.	3/8 in.
1 ¼ to 2 in.	10 ft.	6 ft.	3 ft.	3/8 in.
2 ½ to 4 in.	12 ft.	10 ft.	4 ft.	1/2 in.
5 and 6 in.	12 ft.	10 ft.	4 ft.	5/8 in.
8 in.	12 ft.	10 ft.	4 ft.	3/4 in.
Over 8 in.	To suit loading conditions			

E. Inserts: Provide high density fiberglass or calcium silicate piping inserts to eliminate compression of pipe insulation system, full length of specified piping shield, by pipe size.

1. Make: "H-Block" by ICA, Inc., TPS / TPSX by SPI, or approved equal.

F. Supports:

1. For weights under 1000 lbs.: "Drill-In" inserts equivalent to Phillips "Red Head," "U-Channel," "Unistrut," beam clamps or other structurally reviewed support. The factor of safety shall be at least four. Follow manufacturer's recommendations.

2. For weights above 1000 lbs.: Drill through floor slabs and provide flat flush plate welded to top of rod or provide additional "Drill-In" inserts and hangers to reduce load per hanger below 1000 lbs. The factor of safety shall be at least four.

3. For metal decks: Drill hole through for hanger rods and imbed a welded plate in concrete or use Phillips "Red Head" devices designed for this application, with a safety factor of four.

2.8 PIPING ACCESSORIES

A. Escutcheon Plates: Steel or cast iron polished chrome, split hinge type with setscrew, high plates where required for extended sleeves.

B. Pipe Guides: Cylindrical steel guide sleeve, proper length for travel, integral bottom base anchor; top half removable. Split steel spider to bolt to pipe, copper plated spider for copper pipe. Space between sleeve and spider to allow for insulation where required. Acceptable Make: Anaconda, Flexonics, Pipe Shields, Keflex, or equal.

C. Anchors: Same material as pipe. Acceptable Make: Keflex, Flexonics, Pipe Shields, or field constructed.

D. Pipe Roll Stand: Cast iron roll stand. Acceptable Make: Advanced Thermal Systems, Carpenter and Patterson, Pipe Shields.

2.9 SLEEVES

A. Standard Type:

1. Schedule 40 black steel pipe sleeves, two pipe sizes larger than the pipe, for structural surfaces (bearing walls, structural slabs, beams and other structural surfaces) and where called for.

2. Schedule 40 sleeves or sheet metal sleeves for nonstructural surfaces and existing construction. Sheet metal sleeves shall be 18 gauge minimum and braced to prevent collapsing.

B. Pre-Insulated Type:

1. Adjustable or fixed length metal cans, 24 gauge minimum, sized for 1 in. spacing between insulation and can. Insulation shall consist of a 360º waterproofed calcium silicate insert sized to extend 1 in. beyond wall or floor penetration. Calcium silicate insert shall be same thickness as adjoining pipe insulation. Spacing between shield and can packed at each end with double neoprene coated rope positively fastened.

2.10 SEALING ELEMENTS

A. Waterproof Type:

1. Exterior walls, below grade, above floor: Synthetic rubber material with zinc plated bolts.

2. Acceptable Make: "Link-Seal" Series 200, 300 or 400, Pyropac, Calipco.

2.11 FIRESTOP SYSTEM FOR OPENINGS THROUGH FIRE RATED WALL FLOOR ASSEMBLIES

A. Materials for firestopping seals shall be listed by an approved independent testing laboratory for "Through-Penetration Firestop Systems". The system shall meet the standard fire test for Through-Penetration Firestop Systems designated ASTM E814. Firestop system seals shall be provided at locations where piping passes through fire rated wall, floor/ceiling, or ceiling/roof assembly. Minimum required fire resistant ratings of the assembly shall be maintained by the Firestop System. Installation shall conform to the manufacturer's recommendations and other requirements necessary to meet the testing laboratory's listing for the specific installation.

2.12 PIPING MATERIALS AND SCHEDULE

A. See Exhibit "A," "Schedule of Piping Materials" at end of this Section for (HVAC) piping.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install pipe, tube and fittings in accordance with recognized industry practices which will achieve permanently leak proof piping systems, capable of performing each indicated service without piping failure. Install each run with a minimum of joints and couplings, but with adequate accessible unions and flanges for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, with 1/16" misalignment tolerance.

B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as indicated or described by diagrams, details and notations or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 1.0" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Wherever possible, in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

C. Space pipe supports, arrange reducers, and pitch piping to allow air to be vented to system high points and to allow the system to be drained at the low points, and wherever required to permit complete draining of all lines.

D. Make all changes in size and direction of piping with fittings, except for soft copper tubing, use tubing bender.

E. Install piping to valves, strainers, pumps and other equipment at full line size. Where reduction or increase in size is required, make it with a fitting at the equipment connection.

F. Air Vents: Provide manual air vents at high points in piping system and where indicated on the drawings.

G. Drain Valves: Provide manual drain valves at low points in piping system and where indicated on the drawings.

3.2 EQUIPMENT AND SYSTEMS

A. Equipment and systems in accordance with laws, codes, and provisions of each applicable section of these specifications. Accurately establish grade and elevation of piping before setting sleeves. Install piping without springing or forcing (except where specifically called for), making proper allowance for expansion and anchoring. Arrange piping at equipment with necessary offsets, unions, flanges, valves, to allow for easy part removal and maintenance. Offset piping and change elevation as required for coordination with other work. Avoid contact with other mechanical or electrical systems. Provide adequate means of draining and venting units, risers, circuits and systems. Conceal piping unless otherwise called for. Ream pipes after cutting and clean before installing. Cap or plug equipment and pipe openings during construction. Install piping parallel with lines of building, properly spaced to provide clearance for insulation. Make changes in direction and branch connections with fittings. Do not install valves, unions and flanges in inaccessible locations. Provide trap seal of adequate depth on drain pans.

3.3 WATER SYSTEMS

A. Top connection for upfeed, bottom or side connection for downfeed. Grade off-level; up in direction of flow and down toward drain.

3.4 REFRIGERATION PIPING AND TESTING

A. Refrigerating systems fabricated, assembled, or erected on the premises shall be tested to the applicable requirements of section 9.11 of the 2022 revision of ASHRAE Standard 15. System components that are strength tested prior to field assembly include (but are not limited to), compressors, condensers, precharged linesets, pressure vessels, evaporators, refrigerant bulk storage tanks, safety devices, pressure gages, and control mechanisms.

B. Refrigerant piping and joints installed on the premises shall be exposed for visual inspection and testing prior to being covered or enclosed.

C. Piping System Strength Testing - Refrigerating system components and refrigerant piping shall be tested in accordance with ASME B31.5 or section 9.11 of the 2022 revision of ASHRAE Standard 15. Separate tests for isolated portions of the system are permitted, provided that all required portions are tested at least once.

1. Pressurize with test gas for a minimum of ten (10) minutes to not less than the lower of (a) the lowest design pressure for any system component or (b) the lowest value of set pressure for any pressure relief devices in the system.

2. Remove pressure relief devices and replace with plugs during the strength testing procedures.

3. The design pressures for determination of test pressure shall be the pressure identified on the label nameplate of the condensing unit, compressor, compressor unit, pressure vessel, or other system component with a nameplate. A passing test result shall have no rupture or structural failure of any system component or refrigerant piping.

D. Piping System Leakage Test. The leak test *shall* be in accordance with ASHRAE Standard 147, ASME B31.5, or 5 or section 9.11 of the 2022 revision of ASHRAE Standard 15

1. After the time to complete the strength test, continue to pressure test in accordance with Section 9.13.5 of the 2022 revision of ASHRAE Standard 15 for a minimum period as *specified* in Table 3-5-1.

2. The system *shall* show no loss in pressure on the pressure measuring device during the pressure test. Calculation of the pressure differential based on a change in ambient temperature *shall* be permitted.

3. A vacuum of 0.0097 psi (67 Pa) absolute or lower *shall* be achieved (0.0197. in Hg [32°F]; 500 microns Hg [0°C]; 500 microns). After achieving a vacuum, the system *shall* be isolated from the vacuum pump. The system pressure *shall not* rise above 0.029 psi (200 Pa) absolute (0.059 in. Hg [32°F]; 1500 microns Hg [0°C]; 1500 microns) for a minimum period as *specified* in Table 3-5-1.

Table 3-5-1 Duration of Leak Test

	Pipe Length, *L*		Maximum Nominal Pipe Size		Minimum Period of Test
Leak Test	**ft**	**m**	**NPS, in.**	**DN, mm**	**hours**
Pressure test	$L \leq 100$	$L \leq 30$	NPS ≤ 3/4	DN ≤ 20	0.25
			3/4 < NPS ≤ 3	20 < DN ≤ 75	1.0
			3 < NPS	75 < DN	24
	$100 < L \leq 200$	$30 < L \leq 61$	NPS ≤ 3	DN ≤ 75	1.0
			3 < NPS	75 < DN	24
	$200 < L$	$61 < L$	Any	Any	24
Vacuum test	$L \leq 100$	$L \leq 30$	NPS ≤ 3/4	DN ≤ 20	1.0
			3/4 < NPS ≤ 3	20 < DN ≤ 75	8.0
			3 < NPS	75 < DN	24
	$100 < L \leq 200$	$30 < L \leq 61$	NPS ≤ 3	DN ≤ 75	8.0
			3 < NPS	75 < DN	24
	$200 < L$	$61 < L$	Any	Any	24

E. Contractor Declaration. The installing contractor shall issue a certification of testing to the AHJ verifying strength test and leakage test completion in accordance with the requirements of the 2022 revision of ASHRAE Standard for all systems containing 55 lb (25 kg) or more of refrigerant. The certificate shall give the test date, photograph of the pressure gage at the test pressure, refrigerant designation, test medium, and the field test pressure applied to the high side and the low side of the system. The certification of test shall be signed by the installing contractor and shall be made part of the public record.

3.5 HANGERS, INSERTS AND SUPPORTS

A. Piping shall not be supported by wires, band iron, chains, vertical expansion bolts or from other piping. Support each pipe with individual hangers from concrete inserts, welded supports, or beam clamps of proper configuration and loading design requirements for each location. Trapeze hangers are acceptable for racking of multiple pipes of 1-1/2" or less in size. Follow manufacturer's safe loading recommendations. Suspend with rods of sufficient length for swing and of size as called for, using four nuts per rod. Provide additional rust proofed structural steel members, where required for proper support. Provide oversized hangers where insulation/supports must pass between pipe and hanger. Hangers, when attached to joists, shall only be placed at the top or bottom chord panel point. Only concentric type hangers are permissible on joists; "C" type not permitted on joists. Provide riser clamps for each riser at each floor.

3.6 PIPE CONNECTIONS

A. Solder Connections: Utilize non-acid flux and clean off excess flux and solder. Flux conforming to ASTM B813 shall be used in conjunction with solder conforming to ASTM B32.

B. Brazed Connections: Make joints with silver brazing alloy in accordance with manufacturer's instructions. Remove working parts of valves before applying heat. "Walseal" fittings may be used; if insufficient alloy is showing, face braze such joints. Filler material shall conform to AWS A5.8

C. Threaded Connections: Clean out tapering threads, made up with pipe dope; screwed until tight connection. Pipe dope must be specific for each application. Threads shall conform to ASTM B.1.20.1.

D. FRP Pipe Joints: Bonded with resin catalyst adhesive.

3.7 WELDING

A. Welding shall be performed in compliance with the welding procedure specifications prepared by the National Certified Pipe Welding Bureau. Welded piping shall be fabricated by certified welder. Contractor shall submit proof of current certification of each welder, if requested by Owner. Use full length pipe where possible; minimum distance between welds shall be 18 in. on straight runs. Welds must be at least full thickness of pipe with inside smooth and remove cutting beads, slag and excess material at joints; chamfer ends. Minimum gap 1/8 in., maximum 1/4 in., for butt welds. Overlaps on position and bench welds to be not less than 3/4 in. One internal pass and one external pass minimum required on slip-on flanges. Do not apply heat to rectify distorted pipe due to concentrated welding; replace distorted pipe. Welding is prohibited in existing building, except in the following areas: boiler rooms, mechanical rooms, crawl spaces and roof decks**.** When welding galvanized pipe, apply cold galvanizing on joint after welding.

3.8 HANGER SHIELDS

A. Pre-insulated type or field-insulated type at Contractor's option.

B. Provide for all chilled water and all "non-direct" connection supports.

3.9 SLEEVES

A. Provide for pipes passing through floors, roofs/decks, walls or ceilings.

B. Pre-insulated type: Required for chilled water and refrigerant piping.

C. Standard type: Provide for piping as noted above. Extend 1/8 in. above finished floor in finished areas. In above grade mechanical rooms and other areas with floor drains; use steel pipe sleeves projecting 2 in. above floor. Sleeves shall be as small as practical, consistent with insulation, to preserve fire rating. Fill abandoned sleeves with concrete. Where necessary for pipes to pass through ducts, air chambers or built-up housings and approved by Engineer, provide rubber grommet seals.

D. Roof/deck penetrations: Provide sleeve and deck sealing for watertight installation per detail on Contract Documents.

E. Provide a 0.16 inch thick smooth aluminum jacket over insulated pipes where they pass through sleeves.

3.10 ANCHORS AND GUIDES

A. Provide piping system anchors and guides as shown on the plans, and as recommended by the expansion joint/loop manufacturer. Where an anchor is shown at a change in piping direction, it shall fully control movement in all three axes. In lieu of a single anchor fabricated for two directional pipes, two (2) individual anchors may be provided.

3.11 SLEEVE PACKING

A. Seal void space at sleeves as follows:

B. Interior locations: Firmly pack with fiberglass and caulk.

C. Exterior walls and below grade cored holes: Use sealing element.

D. Fire rated, partitions and floor slabs: Use fire rated sealing elements, materials and methods. Provide per manufacturer's instructions to maintain firestop.

E. Vapor Barriers – provide continuity of vapor barriers through sleeves.

F. Waterproofed floors: Use waterproof sealing element, device, or compound.

3.12 ESCUTCHEON PLATES

A. Provide polished chrome escutcheon plates for exposed piping passing through floors, walls or ceilings, except in Boiler, Fan and Mechanical Rooms.

3.13 CLEANING HOT AND CHILLED WATER AND SYSTEMS

A. Provide temporary bypasses and/or pumps and pump connections as required to circulate the new piping system or segment without cross contamination of other existing or already cleaned systems.

B. Provide circulating pumps with “startup” fine mesh (1/8” or less) strainer screens during cleaning process.

C. After each closed system has been tested and thoroughly flushed, introduce Sodium Carbonate (one lb. for each 30 gallons).

D. Provide chemical feed tank similar to Calgon #20 Micromet and connect across pump outlet valve, or as called for, with three-valve bypass. Provide temporary meter or other means of determining amount of water in system.

E. Operate pumps and arrange control system so that all control valves are open. Fill, vent and circulate system with this solution, while raising to design temperature.

F. Remove, clean and/or replace air vents, strainers, and check valves, which do not function properly.

G. After cleaning strainers, circulate for additional time, then clean strainers again; repeat until strainers are found clean and system runs visibly clear without any signs of sediment. Drain and refill system.

H. Notify Owner's Representative before starting Work. Pumps shall not be operated continuously until system is flushed and strainers cleaned.

3.14 TESTS

A. Test piping and accessories before insulation, connecting to existing piping, and concealment. Repeat as many times as necessary to prove tight system. Notify Owner's Representative at least seven days in advance of each test. Isolate valves and equipment not capable of withstanding test pressures. Make leaks tight; no caulking permitted. Remove and replace defective fittings, pipe or connections. Furnish necessary pumps, gauges, equipment, piping, valving, power and labor for testing. Certify that test have been successfully completed.

B. Schedule of Test Requirements:

1. Hot and chilled water: Hydrostatic, 100 psig at high point of system; two hours duration.

2. Refrigeration: Refer to section for Refrigerant Piping and Testing.

3. Tests: No change in pressure under stable temperature conditions.

4. Equipment: Test at working pressures.

3.15 PIPE LINE SIZING

A. Pipe sizes called for shall be maintained. Pipe size changes shall be made only as reviewed by Owner's Representative. Where discrepancy in size occurs, the larger size shall be provided.

EXHIBIT 'A' – PIPING MATERIALS (HVAC)

Notes are at the end of Exhibit 'A'

SERVICE	PIPE MATERIALS	FITTINGS	CONNECTIONS
Hot water heating	Schedule 40, black steel	Malleable iron and butt weld	2 in. and smaller screwed 2-1/2 in. and larger welded SEE NOTE 1
Hot water heating	HDPE	Butt joint	Thermal fusion Note 2
Hot water heating	Type L copper	Wrought copper or cast bronze, solder end	2 in. and smaller: No-lead solder

Chilled water	Schedule 40, black steel	Butt weld and malleable iron	2-1/2 in. and larger welded or flanged 2 in. and smaller screwed SEE NOTE 1
Chilled water	HDPE	Butt joint	Thermal fusion Note 2
Chilled water	Type L copper	Wrought copper or cast bronze solder end	2 in. and smaller: No-lead solder
Refrigerant	Type L refrigerant grade hard temper, deoxidized copper	Wrought copper, solder end	Sil-Flo "5" silver brazing
Indirect waste piping	Type L copper	Wrought copper	No-lead solder

NOTES FOR EXHIBIT "A":

NOTE 1: Screwed piping permitted in Crawl Spaces, Mechanical Rooms and Boiler Rooms.
NOTE 2: Alternate piping material for sizes greater than 2”.

END OF SECTION 232000

SECTION 232023 – PUMPS

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required, for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Shop drawings and performance curves, on pumps and pump accessories. Clearly indicate which equipment is being submitted.

2.0 PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Pumps shall be non-overloading over their entire performance range with motors capable of running continuously without undue noise, heating, or sparking. Impellers statically and dynamically balanced. Mechanical seals for closed systems, shall be constructed of carbon rings with ceramic mating seat up to 220°F. Packing type seals for open systems only. Materials suitable for water pressures, temperature and conditions for each application. Tapped discharges and suction connections for gauges, vent and drain. With trimmed impeller if required to meet initial delivery requirements. Factory service engineer or machinist must check each pump alignment before pump is started. Include the cost of checking and start-up in pump quotation.

2.2 CIRCULATOR PUMPS (WET ROTOR, ECM VARIABLE SPEED)

A. Variable speed, permanent magnet ECM motor.

B. Modified PPE Impellor, stainless steel impellor “can”.

C. Ceramic shaft and bearings

D. EPDM O ring(s)

E. 145psi working pressure @ 230deg working temperature.

F. Constant speed, constant pressure, proportional pressure vs flow, temperature control and 0-10vdc input operating modes.

G. Provide with Bacnet communication protocol. Shall be BTL certified.

H. Design Equipment: Bell and Gossett Ecocirc (XL)

I. Make: Armstrong Compass, Grundfoss Alpha / Magna Series, Bell and Gossett Ecocirc (XL)

2.3 IN-LINE CENTRIFUGAL PUMPS

A. Designed for continuous operation between 40° and 250°F.

B. In-line, single stage, bronze fitted construction.

C. All pump internals shall be capable of being serviced without disturbing piping connections.

D. Replaceable shaft sleeves at the seal.

E. Enclosed type impeller, keyed to the shaft and secured by a locking cap screw.

F. Factory guaranteed operating performance.

G. Design equipment: Bell & Gossett, Series 80

H. Make: Armstrong, Bell & Gossett, Grundfos.

2.4 BASE MOUNTED, END SUCTION TYPE

A. Designed for continuous operation between 40° and 250°F. Single stage, end suction, bronze fitted, with cast iron volute for service to 175 psi wp. Enclosed, bronze impeller mounted on a hardened, alloy steel shaft with regreasible ball bearings.

B. Pump shall be direct connected to the drive motor by means of a rubber insert, flexible coupling with guard.

C. Pump and motor shall be mounted on a groutable structural steel main-frame with welded cross members.

D. Design equipment: Armstrong.

E. Acceptable Make: Armstrong, Bell & Gossett, Grundfos.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Adjust flow rate (gpm) of each pump to capacity called for on schedule, re-adjust during balancing. Install in-line pumps in locations shown, supported independently of piping, using hangers on both pump flanges.

B. Level base so that pump and pump casing are not strained. Align pumps as directed by the manufacturer. After pumps have been aligned, install dowels to prevent shifting. Fill base with concrete through grouting holes provided in baseplate. Contractor responsible for accurate size of base and exact location of mounting bolts. Contractor responsible for trouble resulting from poor pump alignment. Provide concrete base pad for each base mounted pump.

C. Base mounted end suction pumps shall be provided with inlet suction diffusers. Pipe suction diffuser blow-off (full line size with ball valve) to nearest floor drain. Provide start-up strainers for first 48 hours of operation. Replace after completion of start-up period. Base mounted, double suction type pumps shall have piping arranged so that there is a minimum of eight pipe diameters of straight pipe at the pump suction connections. Where this cannot be maintained due to field conditions, the Contractor shall notify the Engineer immediately, before beginning piping work. Provide inertia bases as called for, determine exact height of bases required for base mounted elbows; shim to match mounting height of base elbow with inlet and outlet of pump. Provide vibration absorber between pump outlet and inlet and base-mounted elbow.

END OF SECTION 232023

SECTION 232133 - WATER SYSTEMS SPECIALTIES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment, and services as required for the complete installation designed in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents and this Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS

A. Submit shop drawings on all water system specialties.

1.4 GENERAL REQUIREMENTS

A. Equipment and accessories shall be rated for a minimum of 125 psi wwp, and 250^{o}F temperatures. Manufacturer's written installation procedures shall become a part of these specifications.

B. Provide equipment, piping, valves, fittings, switches, and miscellaneous equipment necessary and required for the complete installation.

2.0 PART 2 – PRODUCTS

2.1 EXPANSION TANK AND ACCESSORIES

A. Shell and Head: Carbon Steel, welded construction.

B. Design Pressure and Temperature: 125 psi at 240°F.

C. Bladder: Replaceable heavy-duty butyl rubber.

D. ASME Section VIII, Div. 1 with U Stamp.

E. Finish: Red oxide prime coat; factory applied.

F. The tank shall be capable of full acceptance of the tank volume when tank is void of air.

G. Provide lifting rings and supports for floor mounting.

H. Design Equipment: Bell & Gossett Series B, D or B-LA.

I. Acceptable Make: Armstrong, Bell & Gossett, Wessels Company, John Wood Company.

2.2 CHILLED WATER BUFFER TANK

A. Shell and Head: Carbon Steel, welded construction (flanged or threaded connections). Grooved if allowed in Specification Section 232000.

B. Design Pressure and Temperature: 125 psi at 450°F.

C. Provide internal baffle to eliminate stratification of fluid within tank.

D. Provide drain connection at bottom of tank and air bleed connection at top of tank.

E. ASME Section VIII, Div. 1 with U stamp.

F. Finish: Red oxide prime coat; factory applied.

G. Provide lifting rings and supports for floor mounting.

H. Design Equipment: Cemline Series CWB.

I. Acceptable Make: Wessels Series CBT, Amtrol Series CWBT, Laars Series BTNV, John Wood Company Series JBTR.

2.3 AIR REMOVAL ASSEMBLY

A. Centrifugal type air separator.

B. Shell and Head: Carbon Steel, welded construction (flanged or threaded connections). Grooved if allowed in Specification Section 232000.

C. Design Pressure and Temperature: 125 psi at 350°F.

D. Stainer: Removable Type 304 stainless steel with maximum 3/16” perforations and 51% free open area.

E. Designed to collect air to an air removal fitting at the top of the separator.

F. Provide bottom blowdown connection to facilitate routine cleaning.

G. ASME Section VIII, Div. 1 with U stamp.

H. Size: Minimum full size of system piping but shall be oversized for a maximum pressure drop 3.0 ft.

I. Design Equipment: Bell & Gossett Rolairtrol.

J. Acceptable Make: Armstrong, Bell & Gossett, Wessels Company, John Wood Company.

2.4 SUCTION DIFFUSER

A. Body and Strainer Cover: Angle pattern type, cast iron ASTM A126, Class B.

B. Connection Type: Flanged. Grooved if allowed in Specification Section 232000.

C. Inlet Vanes: Stainless steel.

D. Design Pressure and Temperature: 175 psi at 250°F.

E. Unit shall be provided with integrated flow cone, combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. Orifice cylinder shall have a free area five times the cross-sectional area of the pump suction opening.

F. Unit shall be provided with blowdown connection with full size ball valve with hose connection.

G. Provide disposable bronze 16 mesh start-up strainer.

H. Unit shall be provided with adjustable support to carry weight of suction piping and piping accessories.

I. Maximum pressure drop of 3.0 ft. or less.

J. Design Equipment: Bell & Gossett "Suction Diffuser Plus".

K. Acceptable Make: Armstrong, Bell & Gossett.

2.5 STRAINERS – HVAC WATER AND GLYCOL SYSTEMS (NON-POTABLE WATER SYSTEMS):

A. Wye Type Strainer:

1. Bronze 2" and Under (Threaded End or Soldered Connections):

a. Strainer shall be suitable for 150 psi @ 350°F WOG (threaded ASTM B16.15) and 150 psi @ 350 °F WOG (soldered ASTM B16.18).

b. Body: Lead free bronze (NSF/ANSI 372, ASTM B584, C87800, C89833).

c. Cap and Plug: Lead free bronze (NSF/ANSI 372, ASTM B584, C87800, C89833).

d. Screen: Type 304 or 316 stainless steel, 20 mesh.

e. Gasket: Metal filled graphite, PTFE, or copper.

f. Threaded blowdown connection.

g. Acceptable Makes: Mueller Model LF351 (threaded) or Model LF358 (soldered); Keckley Style F7 (threaded) or Style E7 (soldered); Apollo 59LF-000 series (threaded) or 59LF-300 series (soldered).

2. Cast Iron 2 ½" and Larger (Flanged End Connection):

a. Strainer shall be suitable for Class 125, 200 psi @ 150°F WOG (2½" to 12") and 150 psi @ 150 °F WOG (14" and larger) or Class 250, 500 psi @ 150°F WOG (2½" to 12") and 300 psi @ 150 °F WOG (14" and larger).

b. Body and Cover: Lead free cast iron (NSF/ANSI 372, ASTM A126, Class B).

c. Screen: Type 304 stainless steel, 0.062 perforation (2½" to 4") and 0.125 perforations (5" and larger").

d. Gasket: composition.

e. Threaded blowdown connection.

f. Acceptable Makes: Mueller Model 758 (Class 125) or Model 752 (Class 250); Keckley Style A-7 (Class 125 and 250).

2.6 AUTOMATIC AIR VENTS

A. High Capacity Automatic Air Vent:

1. Float type design to remove contained air or non-condensable gases from liquid piping systems with ¾" threaded connections.

2. Body: Cast iron ASTM A126, Class B.

3. Trim: Stainless steel.

4. Valve and valve Seat: Stainless steel and EPDM.

5. Design Pressure and Temperature: 150 psi at 250°F.

6. Acceptable Make: Sarco Model 13WS, Bell & Gossett Model 107A, Armstrong Model 1-AV.

B. General Purpose Automatic Air Vent:

1. Float type design to remove contained air or non-condensable gases from liquid piping systems with ¾" threaded connections.

2. Body: Brass.

3. Trim: Stainless steel.

4. Valve and Valve Seat: Stainless steel and EPDM.

5. Design Pressure and Temperature: 150 psi at 240°F.

6. Acceptable Make: Bell & Gossett Model 87, Taco Model 409 or approved equal.

2.7 BYPASS CHEMICAL FEEDER

A. Cast iron quarter turn closure with Buna-N O-ring. The body shall be carbon steel. Designed for temperatures up to 200°F and pressures up to 200 PSI. The fill capacity shall be greater than 5 gallons.

B. Design Equipment: Calgon #20 Micromet

C. Acceptable Makes: Calgon, JL Wingert Co. or approved equal.

2.8 PUMP AND COIL FLEXIBLE CONNECTORS

A. Bronze Braid and Hose 2" and Under (Soldered End Connection):

1. Hose and Braid Bands: Bronze.

2. End Connections: Copper female soldered ends.

3. Minimum operating pressure of 150 psi at operating temperature of 200°F.

4. Design Equipment: Metraflex Model BBSC.

5. Acceptable Makes: Metraflex, Mason Industries, Inc., Flex-Hose Co. Inc.

B. Stainless Steel Braid and Hose 2" and Under (Threaded) and 2½ and Larger (Flanged and Grooved Connections):

1. Hose and Braid Bands: Series 300 stainless-steel.

2. End Connections: Carbon steel Class 150 flanged, Sch. 40 carbon steel male threaded, or Sch. 40 carbon steel grooved.

3. Minimum operating pressure of 125 psi at operating temperature of 200°F.

4. Design Equipment: Metraflex Model MLPC and RMF (flange to flange), Model GFC (flange to groove), Model GGC (groove to groove), Model SSTC (male thread to male thread).

5. Acceptable Makes: Metraflex, Mason Industries, Inc., Flex-Hose Co. Inc.

2.9 PRESSURE RELIEF VALVE

A. Bronze ¾" to 2" (Threaded End Connection) for Heating Hot Water, Chilled Water and Heating Glycol or Cooling Glycol Systems:

1. ASME Section IV capacity certified for protection of heating hot water systems, pre-set minimum pressure range from 30 psi to 125 psi at 250°F.

2. Body and Cap: Bronze ASTM B584, or cast-iron ASTM A126, Class A/B.

3. Spring: Stainless Steel ASTM A313-631.

4. Seat: Bronze ASTM B584 alloy 84400.

5. Corrosion resistant construction.

6. High Capacity. Sized to relieve full heating capacity of system protecting. Provide multiple valves as required to meet capacity requirements.

7. Acceptable Makes: Kunkle Model 537, McDonnel Miller Series 250, Watts Series 174A, Apollo Model RVW60.

2.10 COIL PIPING PACKAGES ("TERMINATION KITS")

A. General

1. Combines various functions, such as coil isolation, dirt protection strainer, union connections, etc., as shown in project coil termination details into a single packaged device(s).

2. Where any specific components are not addressed within this paragraph, they shall comply with related requirements within this Section or Division 23 of the project manual.

3. Where balance valves are incorporated into the piping packages, a separate isolation valve shall be provided. Balance valves shall not be used for isolation duty.

4. Permitted for use on coils with connection sizes from ½" through 2 ½".

5. ASTM B283, B36 Brass body, rated for minimum of 250psig at 200 deg F.

6. Zinc plated, PBC coated valve handles.

7. 304 Stainless strainer screen, standard 20 mesh.

8. Ball valves to be provided with stainless steel ball and stem, Teflon seats.

9. Double O-Ring shaft seals, "blow-out" proof.

10. Crimp connection compatible with ProPress, Virax and Power Press systems, to be used only where approved or specified. Rated to 200psi at 250 deg F.

B. Hose Kits

1. Use only where specified.

2. Minimum 300psi at 248 deg F.

3. Stainless steel braided with reinforced EPDM core.

4. Brass fittings.

C. Balance Valves – Manual Type

1. May be provided as part of the termination kit, or separately as specified within section 230523.

2. Where provided component to the termination kit:

a. Stainless Steel shaft

b. Selected based on rated flow, NOT pipe size.

c. Nylon glass filled handle.

d. Accuracy +/-5%

e. Multi-turn, globe valve type.

f. Handwheel turns – 7-10, based on size.

D. Basis of Design: Nexus “Coil Paks” (Model X, M or A based on application)

E. Acceptable Make: Griswold, Bell and Gossett

3.0 PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Obtain detailed instructions from each manufacturer for proper method of installation.

B. Equipment and systems shall be installed in accordance with the manufacturer’s installation requirements.

3.2 EXPANSION TANKS

A. For compression tanks pitch connection to heating system 1” in 5 ft. minimum up toward tank. Provide shutoff valve in piping connection to system and 3/4" hose end drain valve on tank. Provide supporting steelwork, hangers, and suspension racks. Provide water make-up connection, site glass, petcocks, and tank fitting.

B. For expansion tanks, provide housekeeping pad with length and width greater than 1.2 times the maximum diameter of the tank for floor mounted tanks. Provide supporting steelwork, hangers, and suspension racks for wall or ceiling hung expansion tanks. Provide pitch connection to heating system 1” in 5 ft. minimum up toward system. Provide automatic air vent at high point. Provide shutoff valve in piping connection to system and 3/4" hose end drain valve on tank. Provide water make-up connection to air separator or system piping before pump suction. Air separator or air/dirt separator shall have automatic high capacity air vent.

3.3 CHILLED WATER BUFFER TANK

A. Provide housekeeping pad with length and width greater than 1.2 times the maximum diameter of the tank. Provide bypass piping to isolate tank full size of system piping. Provide isolation valves on inlet tank connection, outlet tank connection and bypass piping. Provide drain valve at tank full size of drain connection. Pipe drain valve to floor drain. Provide full size manual air vent valve at tank air vent connection.

3.4 SYSTEM FILLING

A. After cleaning, fill each system from low point:

1. With pumps off, vent mains, risers, runouts, and units, working consecutively from low to high point in building. Obtain approximately 2 psi at highest point. Obtain proper air cushion in compression tanks.

3.5 AIR VENTING

A. Provide one of the following vents at points in piping system where air may collect.

1. Manual vent assembly consisting of 1-1/4” x 6” air collection chamber, 1/2" ball valve in accessible location, install hose connection on valve outlet.

2. Automatic vent with air chamber. Automatic air vents are only allowed in mechanical spaces.

B. Equipment Vents:

1. When equipment is above mains: Connect runouts or risers to upper quadrant or top of mains. Install vent assembly concealed within enclosure, consisting of 1” diameter by 4” to 6” long air collection chamber with 1/4" soft copper tube to manual valve. Mount securely near bottom of enclosure, but not fastened to enclosure. For individual units such as radiators, fan convectors and units with return grilles, provide screwdriver operated manual valve, operated from discharge grille or access door. Drill enclosure and position valve for operating without removing enclosure.

2. When equipment is below mains: Connect piping runouts or risers to bottom or lower quadrant of mains. Provide means of purging and draining each unit downstream of the isolation valves. Use tees instead of ells at low point of runouts.

3.6 AIR REMOVAL ASSEMBLY

A. Provide supports and provide blowdown with hose end drain valve full size of opening.

B. When utilizing bladder type expansion tanks, provide automatic high capacity air vent valve. Air vents shall be piped, full size, 12” above finish floor. For glycol systems, the vent shall be piped, full size of equipment connection, to the glycol make-up unit.

3.7 MAKE-UP WATER VALVES

A. Provide for each system, with 3/4 in. ball valve, bypass connection and isolation ball valve at inlet and outlet of make-up valve and check valve downstream of bypass valve. Set valves to provide 2 psi at high point of system. Provide pressure gauge assembly.

3.8 STRAINERS

A. Provide where called for. Provide blowdown connection for strainers with valves. Provide valve type as specified in Specification Section 230523. All blowdown valves shall be provided with a cap or plug. Open ended valves are not allowed.

3.9 SUCTION DIFFUSERS

A. Provide at inlet to base mounted pump.

B. Pipe suction diffuser blowdown connection (full line size with ball valve) to nearest floor drain.

C. Provide support under suction diffuser. Suction diffuser shall not be supported by the pump casing. If inertia base is provided to support pump, suction diffuser support shall be supported off inertia base.

3.10 PUMP AND COIL FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in accordance with the manufacturer's installation requirements.

B. Where pump discharge or suction size is smaller than system pipe size, provide concentric type reducing flexible connector.

C. Install flexible connectors within manufacturer's parallel offset tolerances. Flexible connectors shall not be subjected to the weight of equipment or piping causing deformation of connector.

3.11 PRESSURE RELIEF VALVES

A. Heating Hot Water, Chilled Water: Pipe discharge, full size of valve outlet connection, to floor drain and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

B. Heating Glycol or Cooling Glycol Systems: Pipe discharge, full size of valve outlet connection, to glycol make-up unit tank and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

C. Heat Exchangers: Provide pressure relief valve on heated fluid discharge side of heat exchanger between heat exchanger and isolation valve. The pressure relief valve shall be sized greater than the maximum capacity output of heat exchanger, and not to exceed the maximum working pressure of the heat exchanger or connected piping system, whichever is lower. Pipe discharge, full size of the valve outlet connection, to floor drain and place hanger at elbow. Install piping so as not to introduce stress on pressure relief valve body.

END OF SECTION 232133

SECTION 233000 - SHEETMETAL AND DUCTWORK ACCESSORIES

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 QUALITY ASSURANCE

A. Ductwork shall be fabricated and installed in compliance with latest edition of the following standards:

1. SMACNA Duct Construction Standards - Metal and Flexible Ductwork.

2. SMACNA Duct Liner Application Standard.

3. NFPA Standards, Bulletin 90A, 96, 101.

4. 2020 New York State Mechanical Code

5. Plans and Specifications which exceed the requirements in any of the referenced standards.

B. All sheet metal shall be fabricated and installed by an experienced Contractor specializing in this type of Work.

C. All ductwork shall be maintained to the following cleanliness standards throughout the project:

1. All ductwork is to be shipped to the job site with ends covered in plastic or capped, and fully shrink or poly sheet plastic wrapped. On arrival to the project site, all ductwork shall be manually inspected and anywhere protective plastic or caps that have been damaged shall be cleaned inside and out and re-wrapped prior to storage.

2. Ductwork protective coverings shall be removed only immediately prior to installation.

3. All small fittings and parts shall be bagged.

4. All adhesive labels or part identification markings shall be on the exterior of the ductwork only.

5. Ductwork shall be stored in an area specifically maintained for that purpose which shall remain clean, dry and have minimum exposure to dust.

6. Internal surfaces of ductwork and all ductwork accessories to be installed within ductwork shall be wiped immediately prior to installation to remove excess dust, machining oil and debris.

7. All open ends are to be maintained covered through the progress of construction with self-adhesive poly sheeting.

8. Duct contaminated due to failure to maintain these standards shall be cleaned to the satisfaction of the Owner and Engineer at the cost of this contractor.

1.3 SUBMITTALS

A. Provide a complete shop standard construction manual including construction details for all shop fabricated materials, fittings, and accessories.

B. Provide coordinated sheetmetal shop drawings. Refer to DUCTWORK SHOP DRAWINGS in this specification section for further requirements.

C. Ductwork detail drawings.

1.4 DUCTWORK CLASSIFICATION

A. Duct systems are classified and constructed per the SMACNA pressure classification as follows:

1. All ductwork shall be constructed for a minimum pressure class of 2 in. w.g. unless stated otherwise.

2. Supply duct upstream of air terminal units (supply or return) shall be constructed for a minimum pressure class of 3 in. w.g.

3. Exhaust duct between exhaust fan and the relief hood shall be constructed for a minimum of 3 in. w.g.

1.5 DUCTWORK SHOP DRAWINGS

A. Prepare minimum 1/4 in. scale drawings:

1. Constructed from actual field inspections and measurements so as to assure a complete job.

2. Incorporating dimensions of actual equipment proposed for use on the project.

3. Showing adequate sections, elevations, and plan views and indicating the bottom of ductwork elevations from the finished floor.

4. Indicating all volume dampers, damper access doors, air balance test plugs, and other accessories required for a complete project.

B. Immediately call to the attention of the Engineers any major deviations from the Contract Drawings which must be made. All deviations shall be documented in writing.

C. Submit roof, wall and floor opening dimensions and locations shown on shop drawings.

D. Submit prints to each Contractor of other trades for review for interferences and coordination with their work.

E. Refer to 230010.3.2 for further information related to Sheet Metal Shop and Coordination Drawings

2.0 PART 2 – PRODUCTS

2.1 DUCTWORK MATERIALS

A. Unless otherwise called for, provide materials in accordance with Exhibit I.

2.2 SQUARE AND RECTANGULAR DUCTWORK

A. Transverse and longitudinal duct seams reinforcement shall conform to appropriate tables and figures per SMACNA Pressure Classification for duct construction.

1. “Ductmate" or "Nexus" 4-bolt corner connection systems may be used in lieu of standard construction. Provide all corner brackets, corner bolts, transverse clips, and seals between flange to flange connections

B. Corner closures shall be required as described and illustrated by SMACNA Duct Construction Standards.

C. Throat radius on all elbows shall not be less than dimension of duct in plane of radius. Where this cannot be maintained, use shorter radius with internal guide / splitter vanes per SMACNA guidelines, or square elbow with turning vanes.

D. Bracing and hanging of ductwork shall be per SMACNA Standards for size and pressure class of ductwork being used.

E. Any transformations shall not reduce the ductwork cross-sectional area. Maximum angle in straight duct, 20^{o} for diverging flow and 30^{o} for contraction flow. Transformation from square to round or flat oval seams welded or brazed.

F. Provide 45 degree shoe-taps or 45 degree laterals for square and rectangular branch ductwork. Unless noted otherwise or shown on the contract drawings, 90 degree straight taps or “A” collars are prohibited.

2.3 ROUND DUCTWORK

A. Round Ductwork:

1. Manufactured of galvanized steel ASTM A527, gauges per SMACNA Duct Construction Standards, spiral lock-seam or longitudinal fusion-welded, as called for in Exhibit I.

2. All spiral duct shall have locked seams so made as to eliminate leakage under pressure for which this system has been designed. Longitudinal seams duct shall have fusion-welded butt seams.

3. No longitudinal seam duct (“stovepipe”) will be allowed.

4. Round ductwork fittings:

   a. All fittings fabricated Per SMACNA Standards for round and flat-oval ductwork.

   b. Fittings shall have continuous, welded seams.

   c. 90° tees shall be conical type. 90° tees and 45° laterals up to and including 12 in. diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of any restrictions.

   d. Round taps off the bottom of rectangular ducts down to diffusers shall be made with a 45° square to round shoe-tap.

   e. Spin-in, dovetail, and adjustable take-offs are prohibited unless noted otherwise.

5. Elbows:

   a. Diameters 3" through 12": Two-section stamped and continuously welded elbows.

   b. Over 12": Gored construction with seams continuous welded. Less than 35° - two gores, 36° to 71° - three gores, over 71° - five gores.

   c. Fabricated to a centerline radius of 1.5 times the cross-section diameter.

   d. Use of adjustable Elbows is prohibited.

   e. Use of adjustable Elbows is generally prohibited. If adjustable elbows are to be used, request approval on ductwork shop drawings. Adjustable elbows, minimum 26 gauge, maybe used for round duct up to 12" diameter in Velocity-Pressure Classes 2" w.g. and below. Secure and seal adjustable joints air tight after installation.

6. Joints:

   a. Pipe-to-pipe joints in diameters up to 60" shall be by the use of sleeve couplings, reinforced by rolled beads.

   b. Insertion length of sleeve coupling and fitting collar shall be 2" up to 36" diameter and 4" above 36" diameter.

   c. Provide intermediate reinforcing angle rings per SMACNA requirements for pressure class indicated.

2.4 DUCTWORK SEALING

A. Ductwork sealing shall comply with paragraphs 403.11 of the ECCCNYS.

B. SMACNA duct sealing classification shall be used for duct systems using the following criteria:

1. Seal Class A, shall include transverse and longitudinal joints and duct wall penetrations, grommets at damper shafts for all ductwork to be provided.

C. Approved ductwork sealing materials shall include the following Hardcast products or approved equivalents when and where applied per manufacturer's recommendations and requirements:

1. Water Based Sealants - Versa-grip 181

D. Tapes and mastics used to seal metallic and flexible air connectors shall comply with UL 181B and be marked 181 B-FX for pressure sensitive tape or 181-B-M for mastic.

2.5 TURNING VANES

A. Standard Type:

1. Provided in square elbows as shown on contract drawings. Vanes for ducts with areas greater than 100 sq. in. shall be "double" type having dimensions and spacing as detailed.

2. Make: Elgen, or contractor fabricated.

2.6 DAMPERS IN DUCTWORK

A. Volume Dampers:

1. Provide single blade type volume dampers where duct sizes in both dimensions are under 12". Constructed per SMACNA standards, one gauge heavier than duct material. For round ducts, Rossi RD series blades securely fastened to 3/8 in. sq., cold rolled steel operator rod and B300/B330 end bushings. For rectangular ducts use Greenheck MBD-10M with 3/8 in. sq., cold rolled steel operator rod. Provide quadrant locking handle on standoff for ductwork to be externally insulated. Wing nut friction screw type are specifically prohibited. Shop fabricated or alternate damper manufacturers meeting these specifications are to be submitted for approval.

2. Provide volume dampers at all air outlets, diffusers, grilles. Dampers to be located at branch takeoff collar or as close as practical. Use of register dampers in return or exhaust inlets shall be strictly limited and approved by the Engineer in advance.

3. Provide multi-blade dampers above 12 in. duct dimension in width or depth. Where multi-blade dampers are required, they shall be equal to Ruskin Model CD35. Provide quadrant locking handle on air volume dampers, wing nut friction screw type are specifically prohibited. Provide quadrant locking handle on standoff for ductwork to be externally insulated.

4. For corrosive environments dampers to be 100% aluminum construction.

B. Fire Dampers:

1. See "Fire Dampers" Section 233316.

C. Automatic Air Dampers:

1. Furnished as part of "Control Systems" Section 230923 installed by this Contractor.

2.7 FLEXIBLE DUCTWORK

A. Shall be constructed in compliance with NFPA Bulletin 90A, and UL Standard 181, Class I Air Duct:

1. Consisting of corrosion resistant galvanized steel helix mechanically locked to fabric. Fabric to be a trilaminate of aluminum foil, fiberglass and aluminized polyester.

2. Factory applied, fiberglass exterior insulation, sheathed in a seamless reinforced exterior vapor barrier jacket. Refer to Specification 230700 Insulation for required R-Value and insulation thickness.

3. Flexible ductwork shall be rated for 20" w.g. positive pressure, 10" w.g. negative pressure thru 12" dia.; 5" w.g. negative pressure, 14-16" dia.; 1" w.g. negative pressure 18"-20" dia., 5500 fpm, operating temperature range -20°F to 250°F.

B. Design Equipment: Flexmaster Type 3B (insulated), Flexmaster Type N1-35 (uninsulated).

C. Make: Clevaflex, Flexmaster, Genflex, Thermaflex.

2.8 FLEXIBLE CONNECTIONS TO FANS AND EQUIPMENT

A. Materials for flexible connections shall be fire retardant, water and mildew resistant, and comply with UL Standard 214:

1. Systems up to 2" w.g. s.p.: approximately 20 oz. of fabric per sq. yd. Ventfabrics, Inc., "Ventfab".

2. Systems greater than 2" w.g. s.p., and watertight systems: Of heavy glass fabric, double neoprene coated, approximately 30 oz. per sq. yd. Ventfabrics Inc., "Ventglas".

3. Flexible connections for grease duct system fans shall be listed and labeled for the application per NYSMC 506.3.2.4

2.9 ACCESS DOORS

A. In Ductwork: Shall be double panel construction, 1" rigid insulation when in insulated ducts; SMACNA construction, hinged type. Double cam type only acceptable where hinged type will not fit and if approved by engineer. Same metal as duct, or factory fabricated. Doors airtight to fit system static pressure, minimum size 16" x 12" or as practical based on the specified location. Refer to section 233316, "Fire Dampers", for additional requirements.

B. When installed in intake or exhaust plenums, access doors will be sized to allow for full access to plenum.

C. Where plenums are greater than 4 feet wide or deep, the access door is to be at least 2 ft. wide by 4 ft. tall to allow for personnel entry.

D. Door Hardware:

1. Hinges: Minimum of two per door, at least 1-1/2" long by 1/8" thick, spaced no more than 2 ft. apart and no more than 1/4 of the door size from top to bottom of door. Maximum 4" length, 6 ft. door, for larger doors, length equal to 1/12 door height.

2. Latches: As manufactured by Ventfabrics, Inc. or equivalent. Metal window sash latch not acceptable.

a. Access doors up to 2" w.g.: Ventlok #100/#102.

b. Walk-in doors up to 2" w.g.: Ventlok #260.

c. Access or walk-in above 2" w.g.: Ventlok #310.

E. Make: Air Balance, Ruskin, Ventlok, Elgen.

2.10 INSTRUMENT TEST HOLES

A. Suitable for insertion pitot tubes and other test instruments:

B. Fabricated with heavy screw cap and gasket.

C. With sufficient extension to accommodate exterior insulation where required.

D. Make: Ventlok #699.

3.0 PART 3 – EXECUTION

3.1 REQUIREMENTS

A. Equipment and systems shall be installed in accordance with local and state codes and regulations having jurisdiction.

B. Install all ductwork concealed and tight to the structure above unless noted otherwise on shop drawings. Fabricate only after the approval of shop drawings, and in locations to avoid interference. Ductwork installed without approved shop drawings, which requires removal/modification and/or reinstallation due to conflicts or improper installation shall be corrected at no cost to the Owner.

C. Sizes given on contract drawings are inside dimensions. Keep openings closed with protective caps or blanks during construction to prevent entrance of dirt and debris.

D. Extend access openings, damper rods and levers, to outside of external insulation make systems airtight.

E. No piping, conduit or other obstruction to airflow is permitted in ductwork. Where shown on the drawings or permitted through approved shop drawings, provide with airtight streamlined sleeve, soldered or brazed joint between sleeve and ductwork. Increase size of ductwork to maintain proper cross-sectional area.

F. Provide necessary openings, sleeves, hanger inserts, framing, chases, and recesses, not provided by other trades.

G. Exposed exhaust or return registers and grilles shall be flush with face of duct; exposed supply registers and grilles shall be mounted outside airstream with 45° shoe-tap extension collars.

H. Provide sleeves for ducts passing through walls or floors. Use 14 gauge sleeve with framing through structural surfaces; 18 gauge sheet metal for other cases. Set sleeves 4" above finished floor in Mechanical Rooms, seal watertight to floor.

3.2 FLEXIBLE CONNECTIONS

A. Provide flexible connections for the intake and discharge connections of duct connected to fans and air handling equipment:

1. Round connections made with adhesive and metal drawbands with ends tightly bolted.

2. Rectangular connections made with material securely held in grooved seam between flanges, tightly clipped or riveted on 6" centers.

B. Connections made with a minimum of 2" space between duct and equipment collars, installed in line, and with 1" excess material folded so as not to interfere with airflow through connection.

3.3 FLEXIBLE DUCTWORK

A. Install flexible duct systems, including connections and joints, in accordance with manufacturer's installation instructions, ADC Flexible Duct Performance and Installation Standards Chapter 4 "Installation Requirements", and with UL 181, Class 1 Air Duct.

B. Flexible ductwork shall not pass through any wall, floor or ceiling.

C. Duct slide on depth minimum of 2" and secured with ½" stainless steel worm gear clamp or non-metallic band clamp meeting UL 181B-C. Connections to conform with all manufacturer's requirements. Maintain insulation value and vapor barrier without gaps from branch main to diffuser / grille / register connection.

D. For round-to-oval connections, provide round-oval flexible adapter.

E. Maximum length 48", not to penetrate any wall, ceiling or floor.

F. Maximum one 90° angle wide radius bend from ductwork to outlet. Provide molded flexible elbow support secured to structure to support bend radius. Thermaflex flexflow or approved equal. Use of Panduit straps unapproved means of bend support are specifically prohibited. Where a wide radius cannot be maintained, provide hard duct elbow at outlet.

3.4 TURNING VANES

A. Install fixed turning vanes in square elbows of equal dimensions only.

1. Provide turning vanes in compliance with SMACNA duct construction standards figures 2.3 and 2.4

2. Use large size vanes, 2-1/4" spacing when ducts are 20" or wider.

3. Secure vane runners to duct with spot welding, riveting or sheet metal screws.

4. Seal all penetrations for attachment of vane runners.

B. For unequal dimension elbows:

1. Provide Aero Dyne HEP turning vanes and rail assembly or approved equal

2. Turning valves to be installed in compliance with all manufacturer requirements to obtain intended performance.

3. Adjust vanes for angle of attack per manufacturer instructions

4. Seal all penetrations for attachment of vane runners.

C. When installing in ductwork with internal insulation:

1. Install runners in ductwork inside insulation and bolt through insulation and duct sides, welding bolts to insure rigid installation. Provide build-outs for duct Velocity-Pressure classes above 2" w.g.

3.5 INSTRUMENT TEST HOLES

A. Locate in the following locations:

1. Downstream of fan discharge

2. Downstream of exhaust duct

3. Downstream of fan inlet.

3.6 CLEANING DUCTWORK AFTER INSTALLATION

A. Clean rubbish and dirt from system before fans are turned on.

B. Keep openings closed during this construction period.

C. Pay damages resulting from dirt blown on painted or other finished surfaces.

D. Repair or replace damaged fan wheels, dampers, or other system parts damaged as a result of dirt.

E. Clean system as many times as required until the entire system is dirt-free.

3.7 INSTALLATION ROUND DUCTWORK

A. Use factory fabricated couplings for joints.

B. After the joint is slipped together, sheet metal screws are placed ½" from the joint bead for mechanical strength.

C. Sealer is applied to the outside of the joint and covering the screw heads.

D. Flanged joints shall be made with neoprene rubber gaskets.

3.8 LEAKAGE TEST OF DUCTWORK

A. Where indicated on the drawings or these specifications, and for ALL duct systems designed to operate at 3" wc or higher, conduct duct leakage tests per SMACNA "HVAC Air Duct Leakage Test Manual", latest edition.

1. Ductwork shall be shown to have a rate of air leakage (CL) less than 4.0 as determined in accordance with equation 4-8, paragraph C403.11.2.3 of the ECCCNYS

B. Ductwork designated to operate below 3" wc shall be checked and guaranteed to meet standards of SMACNA Seal and Leakage Classifications, seal Class A. Air balancing and testing shall be used to determine satisfactory operation of duct systems.

C. When leakage above stated limits occurs, ascertain location of leaks and repair as required. Repeat tests as required to document allowable leakage rates have been achieved. Prepare a report similar to that suggested by SMACNA and submit for review. Duct testing shall be conducted in the presence of the Owner's Representative.

D. The following ductwork shall be tested:

1. Supply ductwork from unit discharge to terminal unit inlet.

2. All supply and return ductwork between air handling unit and terminal devices

3. All ductwork between terminal devices and inlets / outlets

4. Exhaust ductwork from fan inlet to terminal devices

3.9 DAMPERS AND AIR CONTROL DEVICES

A. Provide dampers necessary to permit proper balancing of air quantities. Comply with code requirements for smoke and fire control. Prevent introduction of uncontrolled outside air into building through roof and wall openings.

B. When dampers are installed in acoustically lined ductwork, install with insulated "build-outs" per SMACNA.

C. Install fire dampers in accordance with "Fire Dampers" Section and applicable codes.

D. Install all dampers furnished as part of "Control Systems" Section.

3.10 ACCESS DOORS

A. Provide as required for maintenance and service access at:

1. Control dampers
2. Damper motors
3. Smoke, fire and combination smoke / fire dampers for inspection and services as required under NFPA 80 and NFPA 105.
4. Smoke detectors
5. Control instruments
6. Fan bearings
7. Both inlet of terminal heating and/or cooling coils
8. Intake or exhaust plenums
9. Any other equipment requiring periodic inspection or service, complete with angle iron frame.

3.11 DUCT SUPPORTS

A. Provide per SMACNA, same material as duct. Hanger bands to extend down sides and turn under bottom 2”. Minimum two metal screws per hanger. Steel angle or “unistrut” on larger duct. Spaced per building structural system but not greater than 8 ft or the maximum allowable by SMACNA guidelines. Provide extra support angles as required.

B. Provide supports per manufacturers requirements for factory fabricated duct systems.

3.12 AIR AND WATERTIGHT METAL WORK

A. Where water or snow may accumulate and ductwork or where odors or corrosive gasses may collect, ductwork and plenums shall be made watertight by soldering, brazing or welding of joints. Grade ducts down toward waste points and/or toward louvers. Provide valve and drain piping from low point to waste point. The following ductwork shall be constructed air and watertight:

1. Shower Room exhaust ductwork.

2. Intake and exhaust plenums.

3. Swimming Pool exhaust and return air systems.

4. Dryer exhaust ductwork.

B. Test for water-tightness: Before concealment, apply water by hose to check for leaks, witnessed by Owner's Representative.

C. Where ductwork is sufficiently large to allow personnel access, light testing similar to that required for grease duct may be used in lieu of water hose testing prior to installation of any exterior insulation systems.

3.13 SMOKE DETECTION

A. Smoke detectors shall be furnished by Division 26 "Electrical". This Contractor shall install detectors located in ductwork. Clearly indicate locations of smoke detectors on the sheet metal shop drawings.

B. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size required with Division 26 "Electrical".

EXHIBIT I - DUCTWORK MATERIALS

(Notes are at the end of Exhibit "I")

SERVICE	MATERIAL	SPECIAL REQUIREMENTS
Supply, return, vent, relief, and exhaust	Lock forming quality, galvanized steel ASTM 525	Joints and features as called for
Air plenums at roof or wall, intake or exhaust	galvanized steel	Braze or weld watertight. SEE NOTE 1 SEE NOTE 2
Accessories, dampers and air turns	Same or better as parent duct	------

NOTES FOR EXHIBIT I:

NOTE 1: Wall plenums that are likely to see moisture collection due to rain or snow are to be provided with a sloped floor and trapped drain to indirect waste connection.

NOTE 2: Wall plenums greater than 4 ft. wide are to have 16 gauge floor, reinforced to support maintenance or service personnel.

END OF SECTION 233000

SECTION 233316 - FIRE AND SMOKE DAMPERS

1.0 PART 1 – GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Documents.

1.2 SUBMITTALS

A. Types, schedule of sizes, locations, and installation arrangements of all dampers.

B. Manufacturers UL listed installation details for each mounting arrangement.

C. Installation certification per paragraph 3.3 of this section.

D. Identification chart for dampers per paragraph 3.4 of this section.

E. Size, location and construction detail of all fire rated access doors.

1.3 QUALIFICATIONS

A. Provide work in accordance with latest requirements of the New York State Building Code, NFPA 90A, NFPA 101 and UL 555 (Seventh Edition), UL 555S (Fifth Edition). Fire dampers shall be Underwriter's Laboratories classified.

B. All Dampers shall be rated for protection at 350°F and shall be Leakage Class I.

C. Smoke dampers and operator assemblies shall be Underwriter's Laboratories classified as an assembly.

D. All fire rated access doors shall be in accordance with NFPA 80 and 104.

2.0 PART 2 – PRODUCTS

2.1 FIRE DAMPERS

A. Rectangular - Curtain type damper of galvanized steel construction with fusible link, roll formed frame and stainless steel closure spring. UL listed and labeled.

B. Round – 20 gauge galvanized steel sleeve / frame, with 14 gauge galvanized blades. Stainless steel bearings pressed into frame. UL listed and labeled.

C. Dampers are to be selected for no more than 0.1”wc pressure drop in the as-installed conditions, but in no case shall be smaller than the ductwork size stated on the project drawings. Provide necessary duct transitions, sleeves and supports to maintain assembly rating and these free area requirements.

D. Provide duct transitions where duct sizes must be increased to maintain maximum allowable pressure drop or for transition between round / oval / rectangular ductwork systems.

E. 1-1/2 hour rated dampers for assemblies with rating under three hours. Three-hour rated dampers for assemblies with rating of 3 hours or greater.

F. Provide with “break away” duct connections which comply with rated assembly construction details.

G. Fusible link temperature rating of 165°F.

H. Type A, B, C, or “out of wall/floor” as called for on the contract drawings or as required to meet installed pressure drop and performance requirements.

I. Stainless steel or all aluminum construction where required based on application.

J. Design Equipment:

1. Rectangular:

a. Static, 1 ½ hour, Ruskin Model IBD2

b. Static, 3 hour, Ruskin Model IBD23

2. Round – Ruskin FDR25, Static or Dynamic up to 2000fpm.

K. Acceptable Make: Air Balance, Greenheck, National Controlled Air, Prefco, Ruskin, Safe Air, Inc., Venco.

2.2 COMBINATION FIRE/SMOKE DAMPERS

A. Rectangular - Airfoil multi-blade type damper of aluminum construction suitable for installation in high velocity air systems up to 4000 fpm and 8 in. s.p. UL listed fusible link. Frame thickness 16 gauge minimum. Silicone edge blade seals, and stainless steel jamb seals.

B. Round – two piece, 14ga equivalent galvanized steel blades. Stainless steel bearings pressed into frame. Suitable for installation in systems up to 3000fpm and 4 in. s.p. UL listed fusible link. 20 ga frame / sleeve.

C. UL listed 120 volt electric motor operator as scheduled or called out on the contract drawings. Operator to be mounted outside of the airstream. Power to open spring to close.

D. Class I leak rating of 4.0 cfm/ft^2 at 1” w.g.

E. Stainless steel or all aluminum construction where required based on application.

F. Design Equipment:

1. Rectangular: Ruskin FSD-60.

2. Round: Ruskin FSDR-25

G. Acceptable Make: Greenheck, Air Balance, Prefco, Ruskin.

3.0 PART 3 – EXECUTION

3.1 LOCATIONS

A. Provide where called for on the contract drawings and as required per Section 607 of the New York State Mechanical Code.

3.2 INSTALLATION

A. Provide sleeves, angles, and access doors for installation in accordance requirements of NFPA, UL and damper manufacturer. Provide sheet metal access doors in ductwork for dampers and accessories. Provide ceiling or wall access doors for dampers and accessories. Provide rated access doors where required in shafts and other rated assemblies.

B. All fire, smoke and combination dampers to be selected and fully coordinated with access requirements, including required service access and inspection doors. Final selection details, including upstream vs downstream positioning of access doors and damper actuators shall be determined during development of project coordination drawings as described under 230010.3.2.

C. Division 26 "Electric" will provide signal wiring and power wiring for smoke dampers. Refer to Sections 230923 and / or 230993 for additional requirements. Smoke detectors shall be furnished by Division 26 "Electric". Install detectors located in ductwork. Increase duct size at smoke detectors, where required for proper installation, per smoke detector manufacturer's recommendations. Coordinate minimum duct size and length required with Division 26 "Electric". Provide insulation end seal fittings for double wall ductwork where same connects to damper assembly.

D. Provide access door or removable ductwork section for inspection and repair in compliance with NFPA 80 and NFPA 104 for all assemblies. Minimum allowable access door size shall be 12”x12”, minimum allowable length for removable duct section shall be 24 inches.

3.3 CERTIFICATION

A. Contractor shall certify that dampers are accessible for servicing, are installed properly, and are operational. Submit three copies of signed certification to the Owner's Representative for review.

3.4 IDENTIFICATION

A. Provide damper tags and chart. Fasten tag to ductwork adjacent to the dampers. Number each damper and make chart listing.

1. Number

2. Location

3. Air system in which they are installed.

B. Submit three copies of chart to the Owner's Representative for review.

END OF SECTION 233316

SECTION 233400 - FANS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Drawings.

1.2 SUBMITTALS

A. Submittals shall include all fans, motors, drives, and accessories. Include all fan curves and fan operating point.

1.3 QUALITY ASSURANCE

A. Capacity, size and arrangement, static pressure, brake horsepower, component parts and accessories shall be provided as called for or scheduled. All ratings shall be made in accordance with AMCA Standard 210. Guaranteed full capacity delivery through duct systems finally installed and under conditions listed. The manufacturer shall guarantee sound-power level ratings not exceeding those of the design equipment. All equipment shall be statically and dynamically balanced to acceptable tolerances with weights permanently fastened. Fan wheels shall be rebalanced in the field, if necessary.

B. Fans shall be selected such that the rotational speed does not exceed 80% of that allowable for the fan class to be provided.

C. Motors:

1. Motors shall be furnished with each fan of sizes scheduled. Refer to specification Section 230513 for acceptable motor manufacturers. All belt-driven fan motors shall be mounted on either an adjustable slide base or a pivoting base.

2. Fans specified either through model number or motor type to contain ECM motors shall be provided with either local speed adjustment modules or controllers allowing interface to the BMS as required for specified sequences of operation.

D. Drive Systems:

1. Provide fans with belt or direct drive systems as scheduled. V-belt drives as recommended by drive manufacturer, unless otherwise specified or scheduled.

a. Below 10 hp: Size 150% of motor rating.

b. 10hp & up: Size drive for 200% of motor rating.

c. Motors 5 hp and larger shall be provided with a minimum of two matched belts. All belt sets shall be matched.

d. Cast iron or cast steel pulleys.

e. Provide a belt and shaft guards for each driven device. Provide openings in both the motor and fan sections of the guard so that the motor and fan speeds can be checked without removing the belt guard.

E. Motor Pulleys:

1. Adjustable type to produce 15% speed change above and below scheduled fan speed permitted for 5 hp and smaller.

2. Fixed drive pulleys for all motors over 5 hp. Provide replacement pulleys as required to obtain system balance.

3. 7-1/2 hp - 20 hp: "B" section, 4.6 in. minimum pitch diameter.

4. 25 hp & larger: "C" section, 7.0 in. minimum pitch diameter.

5. Drive ratio not over 4:1.

6. Vibration isolation for units shall be furnished by fan manufacturer unless otherwise noted. Where spring vibration isolators are used, they shall be guided spring type.

2.0 PART 2 - PRODUCTS

2.1 ROOF FANS (DOME TYPE)

A. Centrifugal type fan wheel with backward curved blades. Spun aluminum housing. Fan enclosure with removable dome for access to motor, drive, bearings and fan wheel. For belt driven units, the motor and drive shall be isolated from the airstream. The motor shall be mounted on an adjustable base. Permanently lubricated sealed motor bearings.

B. Fan Bearings: 80,000 L-10 life hours per AFBMA.

C. 1/2” x 1/2” aluminum mesh bird screen. Factory mounted and wired disconnect switch. Factory mounted and wired variable speed controller for all direct drive fans. Factory constructed roof curb in accordance with Section 230509.

D. Design Equipment: Greenheck G or Cube.

E. Acceptable Make: ACME, Aerovent, Carnes, Cook, Greenheck, ILG, Penn.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Provide equipment in accordance with manufacturer's instructions. All fans shall meet the intent of the system performance requirements. Provide rubber in-shear vibration isolation for all fans unless otherwise called for differently. Provide necessary supporting ironwork and platforms for equipment as detailed on the contract drawings. Provide guards for all exposed belts, shafts and fan wheels. Change pulley sizes or adjust sheaves as required to make systems deliver specified quantities of air as listed on the Contract Drawings.

B. Provide fan control equipment as specified or scheduled on the Contract Drawings. Coordinate location of fan control equipment with all contractors.

END OF SECTION 233400

SECTION 233600 - VARIABLE AND CONSTANT VOLUME TERMINAL UNITS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Drawings.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all requirements therein.

B. This Contractor shall reference the entirety of Divisions 22, 23 and 26 as they apply to this work, with specific attention to the following sections:

1. Section 230923 – Temperature Controls

1.3 SUBMITTALS

A. Submit terminal units by room number, maximum and minimum CFM, accessories, pressure drops, discharge and sound power data by octave band. Clearly indicate box sizes being proposed. Submit separately the controller and control interface devices being utilized.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications shall be specified in this section, with minimum ten years of documented experience.

B. Product Listing Organization Qualifications: The manufacturer shall be listed with an organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.5 WARRANTY

A. Provide 18 month manufacturer warranty from date of shipment for air terminal units, integral sound attenuators, integral heating coils, and integral controls.

2.0 PART 2 - PRODUCTS

2.1 TERMINAL UNITS

A. General Unit Construction:

1. Unit casing shall be constructed of 22 gauge lock seam galvanized steel. Provide integral sound attenuator as scheduled on drawings.

2. Each unit shall be internally lined with 1" R4.2 fiberglass insulation which meets UL 181 erosion, mold growth and humidity requirements and has a flame spread rating of 25 and a smoked developed rating of 50 for both the insulation and the adhesive when tested in accordance with ASTM E84. Insulation shall be secured with adhesive, with exposed edges fully coated with approved sealant.

3. Factory label each unit with size, location, minimum and maximum CFM, and calibration chart. Air terminal units shall be capable of operating 10 in. W.G. pressure maximum without damage.

4. Casing shall be leakage tested in accordance with ASHRAE 130 to not exceed 1 percent of the maximum rated flow at 1.0"wc, 2 percentage at 3.0"wc.

5. Units to be certified under ARI Standard 880-2017 Certification Program and carry ARI seal.

B. Control and Volume Regulating Devices:

1. Internal unit damper shall be constructed of 18ga galvanized steel with continuous gasket seals for tight shutoff (2% leakage) against a maximum of 3 in. w.g. Damper shall be mounted on a galvanized steel shaft extending through the unit on torque free bearings. Neither the radiated or discharge sound power levels shall exceed the ratings of design equipment as scheduled on the Contract Drawings.

2. The damper shaft shall incorporate a visual position indicator etched into the end of the damper shaft to clearly indicate damper position over a full 90° range of operation.

C. Airflow Sensor:

1. The airflow sensor shall be a differential pressure airflow device measuring total and static pressures, and mounted to the inlet valve.

2. Plastic parts shall be fire-resistant, complying with UL 94.

3. Control tubing shall be protected by grommets at the wall of the airflow sensor's housing.

4. The airflow sensor shall be furnished with a minimum of twelve total pressure sensing ports and four static pressure sensing ports, and shall include an averaging chamber that amplifies the sensed airflow signal.

5. The airflow sensor signal accuracy shall be plus or minus five percent throughout terminal operating range.

D. Hydronic Reheat Coil:

1. Coil shall be factory installed on the terminal unit using slip drive joints and shall be constructed of seamless, .016”, 1/2" copper tube with aluminum plate fins. Tested at the factory to 250 PSI hydrostatic pressure. Control valves shall be provided by the temperature control subcontractor as described in Section 230923. Output capacity and rows as scheduled on the Contract Drawings.

2. Coil heating capacity shall be certified and labeled in accordance with AHRI 410.

3. Heating coils shall be provided with a minimum 4”x6” upstream access door to allow periodic cleaning.

E. Design Equipment: Trane VariTrane

F. Acceptable Makes: Krueger, Price, Trane, Greenheck, JCI.

3.0 PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Suspend terminal units from the building structural system independent of the ceiling system. If this cannot be accomplished, provide additional intermediate angle iron from which the units shall be suspended. Level each unit. Access to terminal unit controls shall be accomplished by remove of ceiling panels or through an access door. Coordinate locations of access doors.

END OF SECTION 233600

SECTION 233713 - REGISTERS AND DIFFUSERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Registers/Grilles/Diffusers. Submit room schedule listing size, throw, direction of throw, accessories, finish, noise criteria levels, material type and color chart.

1.3 GENERAL REQUIREMENTS

A. Each manufacturer shall check noise level ratings for registers and diffusers to insure that the sizes selected will not produce noise to exceed 30 db, "A" scale, measured at occupant level; notify Owner's Representative of problems prior to shop drawing submittal.

B. Pressure drop, air flow and noise criteria selection are based on design equipment. Manufacturers not submitting design equipment must provide written certification in the front of submittal that equipment submitted has been checked against and performs equal to the design equipment.

1.4 REQUIREMENTS FOR REGISTERS

A. General:

1. A register is defined as a grille plus a volume damper.

2. Registers shall be installed "sight-proof" where possible, i.e., high wall register with horizontal blades inclined up, or along a wall with blades facing the wall.

3. Borders and frames shall be of same material as register face unless specified otherwise.

B. Mounting Frames:

1. Provide with screw holes in register face punched and countersunk at factory, and mounting frame drilled and tapped to suit. Sponge rubber gasket between frame and wall or ceiling for all surface mounted frames.

2. Frame shall be overlap type and shall be suitable for type of ceiling where register is to be installed.

C. Finishes:

1. Baked enamel (of colors as selected from the manufacturer's standard color chart), as scheduled.

D. Design Equipment: Price

E. Acceptable Make: Krueger, Titus, Price, Greenheck

1.5 REQUIREMENTS FOR DIFFUSERS

A. General:

1. Provide four way blow unless otherwise noted.

2. Where manufacturer's size recommendations require duct sizes or connections differing from design Contractor shall provide at no change in Contract price.

3. Provide square to round neck transitions as required.

4. Provide sponge rubber gasket for all surface mounted frames.

B. Finishes:

1. Baked enamel (of colors as selected from the manufacturer's standard color chart), as scheduled.

2. Suitable for recessed mounting unless otherwise indicated. Frame style shall be suitable for type of ceiling in which diffuser is to be installed.

C. Design Equipment: Price

D. Acceptable Make: Krueger, Titus, Price, Greenheck

2.0 PART 2 - PRODUCTS

2.1 REGISTER TYPES

A. Type A - (exhaust & return grilles):

1. Steel construction with 18 gauge frame and blades, with horizontal bars on a 3/4" spacing set at 35° fixed deflection.

2. 1-1/4” wide flange.

3. The blades shall be parallel to the long dimension.

4. Model: Price 530.

B. Type B - (Aluminum exhaust and return grilles):

1. Aluminum construction with 0.040-0.050" thick frame and blades, with horizontal bars on a 3/4" spacing set at 35° fixed deflection.

2. 1-1/4” wide flange.

3. The blades shall be parallel to long dimension.

4. Model: Price 630.

2.2 DIFFUSER TYPES

A. Type 1 - (induction nozzle type):

1. 22 gauge steel construction, with face panel finished flush with ceiling system.

2. Core shall be removable and securely held in place to the back pan without noise or vibration.

3. Horizontal air flow pattern.

4. With equalizing grid.

5. Induction nozzles welded to each wing of the inner core. Nozzles shall be oriented at 45 degree angles in split opposite directions.

6. Panel size: 24" x 24", with square inlet as integral part of assembly.

7. Model: Price SMX.

B. Type 2 – (displacement diffuser)

1. Air shall be delivered to the space at low noise levels and low velocities that are even across the diffuser face, in all ducting configurations and without the use of nozzles. Manufacturer shall provide sound and pressure drop data derived from tests in accordance with ASHRAE Standard 70-2006. Performance test data for Drift Rate (%DR) shall be provided based on tests in accordance with ASHRAE Standard 55-2004.

2. Constructed with an equalizing baffle behind the operative diffuser face for uniform, low velocity distribution. There shall be no visible fasteners on the front, top or side panels.

3. Grille sections shall have fixed 0 degree blades spaced 7/16 in. on center. The outer core shall be ¾ in. deep extruded aluminum blades mechanically locked to a 5/16 in. outside diameter aluminum mandrel tube with 0.35 in. thick walls. Blades shall run parallel to the long dimension.

4. The core shall be mechanically fixed to the heavy duty aluminum frame with a ¼ in. rod or bolt through the mandrel tube. The joining flanges shall be constructed of extruded aluminum and capture and conceal the joints of two connection units or end caps.

5. Contractor to provide 20 gauge aluminum bottom to be field installed to connect the ductwork to the diffuser. See details on drawings.

6. The panels and internal baffling shall be constructed of aluminum.

7. Powder coat polyester paint finish. Custom color/finish to be selected by the architect during the submittal process.

8. Model: Price DLE

C. Type 3 - (Aluminum supply air register):

1. Heavy extruded aluminum frame construction with double deflection capability and the front blades shall be parallel to the long dimension . Solid extruded aluminum air foil blades mounted in friction pivots for individual blade adjustment, spaced on 3/4" centers.

2. Key operated opposed blade damper which shall assure even air distribution of air across the grille face as well as volume control.

3. 1-1/4” wide flange with sponge rubber gasket.

4. Model: Price 620.

D. Type 4 - (Steel supply air register):

1. Steel frame construction with double deflection capability and the front blades shall be parallel to the long dimension . Solid extruded aluminum air foil blades mounted in friction pivots for individual blade adjustment, spaced on 3/4" centers.

2. Key operated opposed blade damper which shall assure even air distribution of air across the grille face as well as volume control.

3. 1-1/4” wide flange with sponge rubber gasket.

4. Model: Price 620.

E. Type 5 – (wall recessed displacement diffuser)

1. The displacement flow in-wall diffuser shall be constructed with an aluminum equalization baffle behind the perforated diffuser face for uniform, low velocity distribution of supply air. Both the equalization baffle and the face shall be securely retained in the diffuser frames.

2. The plenum material shall be 24 gauge steel or stainless steel.

3. The diffuser frame shall be constructed of 20 gauge coated steel or stainless steel for rigidity and protection of the perforated face.

4. The perforated front panel shall be constructed of 18 gauge perforated steel or stainless steel.

5. The diffuser front panel shall be secured to the plenum through the wall with factory provided fasteners.

6. The diffuser inlet shall be available for duct connection at the top.

7. Plastic nozzle arrays or any plastic components shall be unacceptable.

8. All steel components shall have B12 White baked-on powder coat finish. Epoxies and their derivatives shall not be acceptable. Visible non-metallic components shall not be acceptable.

9. Model: Price DFW

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in strict accordance with manufacturer's instructions. Rough-in or install per reflected ceiling plan or in locations instructed by Owner's Representative.

B. Provide approved air extractors behind all duct mounted supply registers in exposed ductwork.

C. When the final connection to an exhaust or return grille is made, a 12” minimum height plenum box must be supplied to all grilles. Plenum dimensions shall match grille size.

END OF SECTION 233713

SECTION 233726 - LOUVERS AND PENTHOUSES

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 RELATED DOCUMENTS

A. All work under this section is subject to the Contract Documents. This Contractor shall be responsible for and governed by all the requirements therein.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Louvers including all blade types, finishes and arrangements.

B. Penthouses including materials, finishes and accessories.

C. Provide original color charts for selection of finish.

D. Insulated panels including materials and finishes.

2.0 PART 2 - PRODUCTS

2.1 LOUVERS

A. Factory constructed aluminum louvers.

B. Provide mullions where blade lengths exceed 60 in.

C. With 1/2 " x 1/2" mesh, 14 gauge wire, aluminum birdscreen secured in removable frame, secured to back of louver.

D. Extruded sections 6063-T5 alloy, 0.125” minimum thickness, 4” deep, Double Drainable unless otherwise called for.

E. Sill extension and sill style as required by job conditions.

F. Standard clear anodized finish color as selected at review of submittal.

G. Size, type and free areas indicated in location as called for on the Contract Documents.

H. "Stormproof" design with special curb to trap rain.

I. One-piece structural head, sill, and jambs to eliminate requirement for on-site assembly.

J. All stainless steel fasteners.

K. Design Equipment: Greenheck EDD-401 (4”) Double Drainable Blade.

L. Acceptable Make: Construction Specialties, Inc., Greenheck, Ruskin, Pottorff.

2.2 PENTHOUSES NON-LOUVERED TYPE

A. Housings shall be heavy gauge aluminum construction with hinged hoods designed for intake or relief.

B. All vertical seams shall be continuously welded with lock formed seams on the hood ends.

C. Hoods shall be stressed and sloped for drainage.

D. Provide unit with mill finish.

E. Provide 18” high, insulated, double wall curb.

F. Provide aluminum bird screen.

G. Design Equipment: Greenheck.

H. Acceptable Make: Penn Ventilator, Carnes, Greenheck, Arrow, Cook.

2.3 INSULATED BLANK OFF PANELS

A. General: Fabricate blank-off panels from materials and to sizes indicated and comply with the following requirements:

1. Finish: Same as finish applied to louvers.

2. Attach blank-off panels to back of louver frames with stainless-steel sheet-metal screws.

B. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets, complying with the following requirements:

1. Thickness: 1 inch (25mm).

2. Metal Facing Sheets: Aluminum sheet, 0.032 inch (0.8mm) thick.

3. Insulating Core: Extruded-polystyrene insulation board complying with ASTM C 578, Type VII.

4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer’s standard extruded-aluminum channel frames 0.081 inch (2.06mm) thick, with corners mitered and with same finish as panels.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Install louvers and penthouses as per manufacturer's recommendations.

3.2 LOUVERS

A. Size called for is approximate wall/or masonry opening size. Adjust slightly to suit construction or coursing (review architectural drawings or field conditions for rough opening sizes). Louvers will be installed by General Contractor, assisted by this Contractor. Deliver in ample time. Slope ductwork and plenum to louver weephole or provide drain.

END OF SECTION 233726

SECTION 234000 - AIR FILTERS AND ACCESSORIES

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents. Install equipment in strict accordance with manufacturer's instructions, and as detailed on the Contract Documents.

1.2 SUBMITTALS

A. Filter product data including certification date, pressure drops at the scheduled airflow, schedule of filter sizes for each system. All filter accessories, including framing systems, fastening clips, manometers, and differential pressure gauges.

1.3 QUALITY ASSURANCE

A. Filters shall comply with the requirements of ASHRAE Standard 52-76, and UL Standard 586 - Class II requirements. Filters shall also comply with requirements of applicable State and federal agencies. Filters shall not exceed a flame spread rating of 25 and smoke development rating of 50. The scheduled efficiencies refer to ASHRAE Standard 52-76 average efficiency.

1.4 CERTIFICATION

A. Submit with submittal, a test report prepared by an independent testing laboratory certifying compliance with above standards.

2.0 PART 2 - PRODUCTS

2.1 MEDIUM EFFICIENCY AIR FILTERS (MERV-8 - PLEATED TYPE)

A. 2”/4” thick nonwoven, fine fiber media laminated to a rigid backing. The entire filer encased in a Kraftboard frame. Initial filter pressure drop shall not to exceed that which is scheduled at the rated airflow. Provide filters of sizes and pressure drop as scheduled at the required airflow.

B. Design Equipment: Camfill-Farr.

C. Make: AAF, Camfill-Farr, Flanders.

2.2 MEDIUM EFFICIENCY AIR FILTERS (MERV-13 - PLEATED TYPE)

A. 2”/4” thick nonwoven, fine fiber media laminated to a rigid backing. The entire filter encased in a Kraftboard frame. Initial filter pressure drop shall not to exceed that which is scheduled at the rated airflow. Provide filters of sizes and pressure drop as scheduled at the required airflow.

B. Design Equipment: Camfill-Farr.

C. Make: AAF, Camfill-Farr, Flanders.

2.3 HIGH EFFICIENCY FILTERS (MERV-15 - PLEATED TYPE)

A. Filters constructed of spun glass media with fire-retardant synthetic adhesive sealer, galvanized steel retainer and spun bonded nylon backer. Suitable for use up to 190°F and 100% RH ambient conditions. Provide filters of sizes and pressure drops as scheduled at the required airflow.

B. Design Equipment: Camfill-Farr.

C. Acceptable Makes: AAF, Camfill-Farr, Flanders.

2.4 MAGNEHELIC GAUGE

A. 3-7/8" diameter white dial diaphragm actuated air filter gauge. Guaranteed accurate to ± 2% of full scale. Pointer zero adjustment. Provide all accessories including adaptors, mounting panel, pressure tips, fittings, tubing, vent valves.

B. Design Equipment: Dwyer.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide one set of spare filters of each type for each system requiring a filter. Install first set of filters when units are initially installed (as opposed to started). Change filters as required during construction period to maintain systems in a clean manner throughout the construction period. Remove dirty set and install one clean set prior to Owner occupancy. If original filters do not require replacement, as determined by Owner's Representative, then deliver final set to Owner and obtain receipt. Seal between filter frames to prevent leakage. Install on frames without racking to eliminate air bypass.

3.2 MAGHEHELIC GAUGES

A. Provide for each filter set where not provided by the equipment manufacturer.

END OF SECTION 234000

SECTION 236423 – AIR-COOLED CHILLER WITH REMOTE EVAPORATOR

1.0 PART 1 - GENERAL

1.1 SUMMARY

A. Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled scroll compressor chillers

1.2 REFERENCES

A. Comply with applicable Standards/Codes of ARI 550/590-98, ANSI/ASHRAE 15, ETL, ASME Section VIII, NEC, ASHRAE Standard 90.1 and OSHA as adopted by the State.

B. Chiller to be UL Listed.

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with the specifications.

B. Submittals shall include the following:

1. Dimensioned plan and elevation view drawings, required clearances, and location of all field connections.

2. Summary of all auxiliary utility requirements such as: electricity, water, compressed air, etc. Summary shall indicate quality and quantity of each required utility.

3. Single line schematic drawing of the power field hookup requirements, indicating all items that are furnished

4. Schematic diagram of control system indicating points for field interface/connection.

5. Field installed refrigerant piping diagram with line sizes and refrigeration specialties shown.

6. Diagram shall fully delineate field and factory wiring.

7. Installation manuals.

8. BACnet compliance statement, to include complete BACnet objects list for review by the Engineer. From this list, the subset of BACnet objects to be displayed on the OWS shall be developed and forwarded to the 230923 contractor for their use.

1.4 QUALITY ASSURANCE

A. Qualifications: Equipment manufacturer must specialize in the manufacture of the products specified and have five years of experience with the equipment and refrigerant offered.

B. Regulatory Requirements: Comply with the codes and standards specified.

C. Chiller manufacturer plant must be ISO9002 Registered.

1.5 DELIVERY AND HANDLING

A. The outdoor section shall be delivered to the job site with a holding charge.

B. Comply with the manufacturer's instructions for rigging and handling equipment.

1.6 WARRANTY

A. The refrigeration equipment manufacturer's warranty shall be for a period of one year from date of equipment start up but not more than 18 months from shipment. The warranty shall cover material and workmanship that prove defective within the above period and resultant loss of refrigerant. Provide extended 5 year warranty for compressors.

1.7 MAINTENANCE

A. Maintenance of the chillers shall be the responsibility of the Owner and performed in accordance with the manufacturer's instructions.

2.0 PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Design Make: Trane RAUJ

B. Acceptable Makes: Johnson Controls, Daikin, Trane

2.2 UNIT DESCRIPTION

A. Provide and install as shown on the air-cooled scroll compressor chiller systems in the quantity specified. Each system shall consist of hermetic tandem or triple scroll compressors, air-cooled condenser section, control system and all components necessary for controlled unit operation.

B. A multi-circuit, direct expansion, insulated evaporator shall be provided for remote location and be installed and piped to the outdoor unit by the installing contractor.

2.3 DESIGN REQUIREMENTS

A. General:

1. Provide a complete scroll compressor chiller system consisting of an outdoor compressor-condenser section and a remote indoor evaporator as specified herein and as shown on the drawings. The unit shall be in accordance with the standards referenced in Section 1.02 and any local codes in effect.

B. Performance:

1. Refer to the schedule of performance on the drawings. The chiller shall be able to operate to at least 25 percent of full load without hot gas bypass.

2. Unit shall have a minimum Integrated Part-Load Value (IPLV) of 14.6.

3. Refrigerant shall be R-454b.

C. Acoustics:

1. Sound pressure levels for the unit shall not exceed the following specified levels. The manufacturer shall provide compressor sound reduction material and sound treatment to meet these levels. Sound shall be provided with the quotation and be measured at 30 feet from the unit an one meter above the unit base line:

Octave Band							
63	125	250	500	1000	2000	4000	8000
Sound Pressure at 100% Load							
67	73	68	67	64	59	52	47

2.4 CHILLER COMPONENTS

A. Compressors:

1. The compressors shall be two sets of tandem or triple hermetic scroll type compressors with discharge service valve, crankcase oil heater and suction strainer. Compressors shall have a forced feed lubrication system with a reversible oil pump and factory oil charge. The compressor motors shall be refrigerant gas cooled, high torque, hermetic induction type, two-pole, with inherent thermal protection on all three phases and shall be mounted on rubber-in-shear vibration isolator pads.

B. Remote Evaporator:

1. The evaporator shall be compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates. The evaporator is protected with an electric resistance heater and insulated with 3/4"(19mm) thick closed-cell polyurethane insulation. This combination provides freeze protection down to -20° F (-29° C) ambient air temperature. The suction line is insulated from the evaporator to the split at the compressors. The water side working pressure is 653 psig (4502 kPa). Evaporators are designed and constructed according to, and listed by, Underwriters Laboratories (UL).

C. Condenser:

1. The condenser coils shall consist of 3/8 inch (10mm) seamless copper tubes mechanically bonded into plate type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main condenser coil. Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct drive fan motors. Each fan shall be in its own compartment to eliminate cross flow of condenser air during fan cycling and shall be equipped with a heavy-gauge vinyl coated fan guard. Fan motors shall be weather protected, three-phase, direct-drive, 1140 rpm, TEAO type. External coils shall have wire mesh protective guards.

D. Refrigerant Circuit:

1. The refrigerant specialties shall be supplied by the unit manufacturer and include a liquid line shutoff valve, refrigerant filter-drier, sight glass with moisture indicator, liquid line solenoid valve, thermal expansion valve, and insulated suction line. The factory specialties, along with piping and insulation furnished by the installing contractor shall be field installed and wired ready for operation by the contractor.

2. Refrigerant circuit shall be designed to operate with refrigerant R-410A.

E. Control System:

1. Factory provided BACnet based DDC controls.

F. The unit base and coil supports shall be fabricated from heavy gauge steel and painted with powder coat paint. Incidental supports can be galvanized.

2.5 OPTIONS AND ACCESSORIES

A. The following options shall be included:

1. Wire mesh guards for lower portion of the unit.

2. Chilled water flow switch, thermal dispersion type, to be field mounted in the chilled water line and field wired to terminals in the control panel.

3. Factory installed nonfused disconnect switch, with through-the-door handle, mounted in the unit control panel

4. Factory installed circuit breaker to provide unit short circuit protection.

5. Phase loss with under/over voltage protection and with LED indication of the fault type.

6. Factory supplied spring vibration isolators.

7. Low ambient operation package for use down to -10 deg F, to include factory supplied Wind Baffles and Hail Guards, and variable speed operation of condenser fans.

8. Factory supplied Equipment Support Rails. Rails and mounting details shall be provided incompliance with Section 230550.

9. Factory supplied single point connection.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's requirements, shop drawings, and contract documents.

B. Adjust and level chiller in alignment on supports.

C. Coordinate electrical installation with electrical contractor.

D. Coordinate controls with control contractor

E. Provide all appurtenances required to provide a fully operational and functional chiller

3.2 START-UP

A. Provide proper charge of refrigerant and oil.

B. Provide testing, and starting of machine, and instruct the Owner in its proper operation and maintenance.

END OF SECTION 236423

SECTION 237219 – AIR TO AIR ENERGY RECOVERY EQUIPMENT

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawings on components and accessories.

1.3 GENERAL REQUIREMENTS

A. Energy Transfer: Shall be capable of transferring both sensible and latent energy between air streams. Latent energy transfer shall be accomplished by direct water vapor transfer from one air stream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

B. Passive Frost Control: Energy-transfer element shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional extreme conditions shall not affect the usual function or performance of the element. No condensate drains will be allowed.

C. Continuous Ventilation: Unit shall have the capacity to operate continuously without the need for bypass, recirculation, preheaters, or defrost cycles under normal operating conditions.

D. Positive Air Stream Separation: Unit shall have the capacity to operate continuously without the need for bypass, recirculation, preheaters, or defrost cycles under normal operating conditions.

E. Laminar Flow: Airflow through the energy exchange element shall be laminar, avoiding deposition of particulates on the interior of the energy exchange plate material.

1.4 QUALITY ASSURANCE:

A. The energy recovery cores used in these products shall be certified by ARI under its Standard 1060 for Energy Recovery Ventilators. ARI published certifications shall confirm manufacture’s published performance for airflow, static pressure, temperature and total effectiveness, purge air (OACF) and exhaust air leakage (EATR). Products that are not currently ARI Certified will not be accepted.

B. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

C. Unit shall be listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers.

D. The core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. Balance of Unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of purchase.

2.0 PART 2 - PRODUCTS

2.1 ENERGY RECOVERY UNIT

A. General

1. Provide unit and duct connection orientation per project documents.

2. No moving parts are allowed in the ERV modular assemblies.

B. Construction

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.

2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.

3. The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped corners and zinc-plated screw fasteners.

4. Provide double wall construction with 24-gauge galvanized steel liner

5. Access doors shall provide easy access to ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets.

6. Case walls and doors shall be insulated with 1 inch, 4 pound density, foil/scrim faced, high-density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers.

7. The ERV cores shall be protected by a MERV-13 rated, 2" nominal, pleated, disposable filter in both airstreams. Provide additional set of filters for post construction.

8. Hinged and latched access doors will be provided on each end of the unit.

C. Design Make: Renewaire

D. Acceptable Makes: Renewaire, Systemaire, Fantech.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Location as called for on project documents.

B. Connect ductwork per AMCA, ASHRAE, and SMACNA guidelines.

C. Provide service clearances as indicated on the plans.

D. Provide a 4” poured concrete equipment pad for all floor mounted units.

E. Provide a structurally suitable support for the base of any wall mounted or hung units.

END OF SECTION 237219

SECTION 237313 – INDOOR AIR HANDLING UNIT

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applied Air Handling Units.

1.2 RELATED SECTIONS

A. Section 230020 - Basic Mechanical Requirements

B. Section 230513 – Motors

C. Section 230514 – Electric Wiring

D. Section 230923 – Temperature Controls

E. Section 234000 – Air Filters and Accessories

1.3 REFERENCES

A. AMCA Publication 99 – Standards Handbook.

B. AMCA Publication 611 – Certified Ratings Program – Airflow Measurement Performance

C. AMCA Standard 500-D – Laboratory Methods of Testing Dampers for Rating.

D. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.

E. ANSI/AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.

F. ANSI/AMCA Standard 610 – Laboratory Methods of Testing Airflow Measuring Stations for Rating.

G. ANSI/AHRI Standard 410 - Forced Circulation Air-Cooling and Air-Heating Coils.

H. ANSI/AHRI Standard 430 - Central Station Air Handling Units.

I. ANSI/ASHRAE Standard 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

J. ANSI/ASHARE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality.

K. ANSI/ASHARE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.

L. ANSI/NEMA MG 1 – Motors and Generators.

M. ANSI/UL 900 – Standard for Safety Air Filter Units.

N. AHRI Standard 260 – Sound rating of Ducted Air Moving and Conditioning Equipment.

O. ASHRAE Standard 111 – Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

P. ASTM B117 - Standard Practice for Operation Salt Spray Apparatus.

Q. ASTM C1071 – Thermal and Acoustic Insulation (Mineral Fiber, Duct Lining Material).

R. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Material and Facings.

S. ASTM E477 – Standard Test Method for Measure Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.

T. NFPA 70 – National Electrical Code®.

U. UL 1995 – Standard for Safety Heating and Cooling Equipment

1.4 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Air handling units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard 430.

C. Air handling units with fan sections utilizing multiple fans shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.

D. Airflow monitoring station: Certify airflow measurement station performance in accordance with AMCA 611.

E. ISO 9001 Certification.

1.5 SUBMITTALS

A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Engineer.

B. AHU manufacturer shall provide the following information with each shop drawing/product data submission:

1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.

2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.

3. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.

4. All performance data, including capacities and airside and waterside pressure drops, for components.

5. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.

6. For units with multiple fans, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Finally, a fan curve shall be provide showing the performance of the bank of fans when one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

7. A filter schedule that complies with Section 234000 must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.

8. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.

9. An electrical MCA – MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).

10. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000, and 8000 Hz.

11. The AHU manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.

12. The AHU manufacturer shall list any exceptions to the specification.

13. Where the AHU manufacturer supplies components of the temperature control system (sensors, freezestats, air flow stations, actuators, etc.) as part of the air handler, a complete submission for the components, including all wiring requirements with clear delineation between field and factory wiring, shall be provided in compliance with section 230923.

1.6 REGULATORY REQUIREMENTS

A. Agency Listings/Certifications

1. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.

2. Certify air handling units in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified in accordance with AHRI Standard 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.

3. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.

4. Certify airflow monitoring stations are tested for differential pressure in accordance with AMCA 611 in an AMCA registered laboratory and comply with the requirements of the AMCA Certified Ratings Program. Airflow monitoring station shall be licensed to bear the AMCA Seal.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging and final placement of AHU sections. Indoor AHUs less than 100 inches wide shall allow for forklift transport for maneuverability on jobsite.

C. Deliver units to jobsite with fan motor(s), sheave(s), and belt(s) completely assembled and mounted in units.

D. Indoor air handling units shall be shipped in a clear shrink-wrap or stretch-wrap to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.

E. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.9 WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a standard parts and labor warranty that covers a period of five (5) years from unit start-up or sixty-six (66) months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Unit layout and configuration shall be as defined in project plans and schedule.

B. Unit manufacturer to provide an integral base frame to support all sections of unit and raise unit for proper trapping. Contractor will be responsible for providing additional height of the housekeeping pad when indoor air handling unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel.

C. Entire indoor air handling unit shall have a 6-inch full perimeter base rail for structural rigidity and condensate trapping, as shown on contract documents.

2.2 UNIT CASING

A. Unit manufacturer shall ship separate segments so unit can be broken down for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Indoor air handling unit casing finish to meet ASTM B117 250-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.

B. Casing performance – Casing air leakage shall not exceed 1% of design airflow at 8 inches w.g.

C. Air leakage shall be determined at a casing static pressure of 8 inches w.g. Specified air leakage shall be accomplished without the use of caulk. Total estimated air leakage shall be reported for each unit in CFM, as a percentage of supply air, and as an ASHRAE 111 Leakage Class.

D. Under 55°F supply air temperature and design conditions on the exterior of the unit of 84°F dry bulb and 69°F wet bulb, condensation shall not form on the casing exterior. The AHU manufacturer shall provide tested casing thermal performance for the scheduled supply air temperature plotted on a psychrometric chart. The design condition on the exterior of the unit shall also be plotted on the chart. If tested casing thermal data is not available, AHU manufacturer shall provide, in writing to the Engineer and Owner, a guarantee against condensation forming on the unit exterior at the stated design conditions above. The guarantee shall note that the AHU manufacturer will cover all expenses associated with modifying units in the field should external condensate form on them. In lieu of AHU manufacturer providing a written guarantee, the installing contractor must provide additional external insulation on AHU to prevent condensation.

E. Unit casing (wall/floor/pressure bulkhead roof panels and doors) shall be able to withstand up to 1.5 times design static pressure up to +8" w.g. in all positive pressure sections and -8" w.g. in all negative pressure sections, whichever is less, and shall not exceed 0.0042" per inch of panel span (L/240).

F. Floor panels shall be double-wall construction and designed to support a 300-lb load during maintenance activities and shall deflect no more than 0.0042" per inch of panel span.

G. Unit casing panels shall be 2" double-wall construction, with solid galvanized exterior and solid Interior Liner galvanized interior, to facilitate cleaning of unit interior.

H. Unit casing panels (pressure bulkhead roof panels, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 Hr*Ft2*°F/BTU.

I. Unit casing panels (pressure bulkhead roof panels, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.

J. Structural frame must not extend from air-handling unit interior to exterior. All component and panel support structure must be internal to AHU. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.

K. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.

L. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.

M. Treadplate shall be applied to the unit floor to improve the walking surface in those unit sections where the floor is fully accessible, and not impeded by internal structural or functional features. This shall apply to units mounted on concrete equipment pads. Ceiling hung units do not require treadplate.

2.3 ACCESS DOORS

A. Access doors shall be 2" double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.

B. All doors shall be provided with a thermal break construction of door panel and door frame.

C. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.

D. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.

E. Handle hardware shall be designed to prevent unintended closure.

F. Access doors shall be hinged and removable without the use of specialized tools to allow.

G. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.

H. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section.

I. All doors shall be a minimum 60" high when sufficient height is available, or the maximum height allowed by the unit height.

J. A single door handle shall be provided for each door linking multiple latching points necessary to maintain the specified air leakage integrity of the unit.

K. A shatterproof window shall be provided in all access doors.

L. All doors shall be provided with a test port to allow for pressure / temperature testing.

M. Door shall swing outward for unit sections under negative pressure, inward for unit sections under positive pressure. Doors limited from swinging inward (such as side access filter sections) on positive pressure sections, shall have a secondary latch to relieve pressure and prevent injury upon access. Any outward swinging access doors in positively pressurized compartments shall be provided with interlock switches which immediately shut down supply and return air fans if the door is opened. Hard wire interlock wiring shall be by the 230923 contractor.

2.4 PRIMARY DRAIN PANS

A. All cooling coil sections shall be provided with an insulated, double-wall, stainless steel drain pan.

B. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements.

C. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

D. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

E. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2” beyond the base to ensure adequate room for field piping of condensate traps.

F. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

G. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.

H. Drain pans shall be provided for heating coils, access sections, and mixing sections as indicated in the plans.

2.5 FANS

A. Fan sections shall have a minimum of one access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components.

B. Provide fans of type and class as specified on the schedule. Fan shafts shall be solid steel, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans controlled by variable frequency drives shall be statically and dynamically tested for vibration and alignment at speeds between 25% and 100% of design RPM. If fans are not factory-tested for vibration and alignment, the contractor shall be responsible for cost and labor associated with field balancing and certified vibration performance. Fan wheels shall be keyed to fan shafts to prevent slipping.

C. Direct-drive plenum fans, shall be mounted on spring isolation bases. Internally-mounted motor shall be on the same isolation base. Fan and motor shall be internally isolated with spring isolators. Unit sizes up to nominal 4,000 cfm shall have 1-inch springs. Unit sizes larger than nominal 4,000 cfm shall have 2-inch spring isolators. A flexible connection (e.g. canvas duct) shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

D. Fan sections containing multiple fans shall be provided as indicated on the schedule and drawings. Each fan shall operate in parallel to each other fan in the array. The fans shall be SWSI plenum type with high efficient AF blades. Fans shall be direct-driven. Fan wheels shall be aluminum. The Hp characteristic of the fans shall be non-overloading.

E. Fan sections containing multiple fans shall be controlled using a common control signal, such as the duct static control signal, to modulate the fan speed.

F. Fan section panels shall include an acoustical liner to meet acoustical requirements. The liner shall be fabricated from a third wall perforated material to prevent corrosion and designed to complete encapsulate fiberglass insulation. The perforation spacing and hole size shall be as to prevent insulation breakaway, flake off, or delamination when tested at 9000 fpm, in accordance with UL181 or STM C1071. Insulation material must be resistant to fungi in accordance with ASTM C1338.

2.6 MOTORS AND DRIVES

A. Motors shall meet or exceed all NEMA Standards Publication MG 1 – 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.

B. Fan Motors shall be heavy duty, NEMA Premium efficient, all motors shall be provided per Section 230513

C. Direct-driven fan sections shall use 2-pole (3600 rpm), 4-pole (1800 rpm), or 6-pole (1200 rpm) motors as scheduled, NEMA Design B, with Class B insulation to operate continuously at 104°F (40°C) ambient without tripping of overloads. Multiple fan selections utilizing 8-pole (900 rpm) motors are unacceptable due to motor inefficiency, cost, and replacement lead times.

D. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

E. Manufacturer shall provide for each fan a nameplate with the following information to assist air balance contractor in start up and service personnel in maintenance:

1. Fan and motor part number

2. Fan and motor bushing part number

3. Fan design RPM and motor HP, service factor, operating voltage and FLA.

2.7 COILS

A. Each Coil section shall have a dedicated removable panel to allow for removal and replacement of coils without impacting the structural integrity of the unit.

B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

D. Construct heating coil casings of galvanized steel. Construct cooling coil casings of stainless steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube. Coil supports shall be constructed of the same material as the coil casing.

E. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle shall be degreased and cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.

F. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the primary drain pan.

G. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.

H. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

I. Hydronic Coils

1. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.

2. Coils shall be proof-tested to 450 psig and leak-tested to 300 psig air pressure under water. Provide Coil Inspection Certification certifying that coil was tested at specified pressures in compliance with the specification and codes.

3. Headers shall be constructed of round copper pipe or cast iron.

4. Tubes shall be 5/8 inch O.D., 0.035 inch thick copper. Fins shall be aluminum.

5. Hydronic coils shall be supplied with factory installed drain and vent piping to the unit exterior.

2.8 FILTERS

A. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size and quantity required to maximize filter face area for each air handling unit.

B. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule. Filter type shall be per Section 234000.

C. Manufacturer shall provide one set of startup filters. Provide a complete replacement set to the Owner.

D. Each filter section shall be provided with a factory-installed, flush-mounted Dwyer dial-type differential pressure gauge piped to both sides of the filter to indicate status. Gauge shall maintain a +/- 5 percent accuracy within operating temperature limits of -20°F to 120°F. Filter sections consisting of pre- and post-filters shall have a gauge for each.

2.9 DAMPERS

A. All dampers, with the exception of external bypass, shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

2.10 ACCESS SECTIONS

A. Access sections shall be provided where indicated in the schedule and plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer’s maintenance manual.

2.11 DISCHARGE PLENUM SECTIONS

A. Plenums shall be provided as indicated in the schedule and plans to efficiently turn air and provide acoustical attenuation. Discharge plenum opening types and sizes shall be scaled to meet pressure drop requirements scheduled and align with duct takeoffs.

B. Discharge plenum panels shall include an acoustical liner with perforated double wall construction to meet acoustical requirements. The liner shall be fabricated from a third wall perforated material to prevent corrosion and designed to completely encapsulate fiberglass insulation. The perforation spacing and hole size shall be such as to prevent insulation breakaway, flake off, or delamination when tested at 9000 fpm, in accordance with UL 181 or ASTM C1071. Insulation material must be resistant to fungi in accordance with ASTM C1338.

2.12 MARINE LIGHTS

A. Marine lights shall be provided in all AHU access sections, discharge plenums and mixing box/inlet sections. Lights shall be instant-on, light-emitting diode (LED) type to minimize amperage draw and shall produce lumens equivalent to a minimum 75W incandescent bulb (1200 lumens). LED lighting shall provide instant-on, white light and have a minimum 50,000 hr life.

B. Light fixture shall be weather-resistant, enclosed and gasketed to prevent water and dust intrusion.

C. Fixtures shall be designed for flexible positioning during maintenance and service activities for best possible location providing full light on work surface of interest and not being blocked by technician.

D. All lights on a unit shall be wired in the factory to a single on-off switch.

E. Installing contractor shall be responsible for providing 115V supply to the factory-mounted marine light circuit.

F. Coordinate with Electrical Contractor for field wiring the lighting circuit and the convenience outlet together.

2.13 CONVENIENCE OUTLETS

A. A 15-amp, 115V GFCI convenience outlet shall be provided by the AHU manufacturer. The outlet shall be separate from the load side of the equipment per NEC requirements. Installing contractor shall be responsible for providing 115V supply to the factory-mounted GFCI outlet circuit per NEC (even when single-point power is specified to be provided by AHU manufacturer).

B. Coordinate with Electrical Contractor for field wiring the lighting circuit and the convenience outlet together.

2.14 OVERLOAD BOX

A. Provide factory installed overload panel which is a NEMA type 1 enclosure to maintain air leakage integrity of the casing.. The panel will take one field VFD power input and distribute to multiple fans as scheduled. These fans will be protected by manual motor protectors, one per fan. Auxiliary contacts are wired in series to terminal blocks for generic trip signaling. Panel is rated for WYE power systems up to 600V.

2.15 FACTORY-INSTALLED MOTOR WIRE TERMINATION

A. Any welds shall be properly finished with no rough edges. Enclosures shall house circuit breaker disconnects, bypass circuitry, Drive-OFF-Bypass switches, manual speed controls, and control transformers. VFDs and starter/disconnects shall have an external disconnect located on the outside of the access door.

2.16 FACTORY WIRING

A. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6’ in length may be contained in FMC.

2.17 EQUIPMENT PARAMETERS

A. Design: Trane Performance Climate Changer

B. Acceptable Makes: Daikin, JCI/York Solution

3.0 PART 3 – EXECUTION

3.1 SHIPPING

A. Paper copies of the IOM shall also be shipped with each AHU.

B. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

C. To protect equipment during shipment and delivery, all indoor units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment.

D. After loading the equipment for shipment, the AHU manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.2 ON-SITE STORAGE

A. If equipment is to be stored for a period of time prior to installation, the Mechanical Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.3 FIELD EXAMINATION

A. The Mechanical Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

B. The Mechanical Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.4 INSTALLATION

A. The Mechanical Contractor shall be responsible to coordinate ALL installation requirements with the Owner and the Owner's selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or -welded joints, and all other installation and assembly requirements.

B. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

C. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:

1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.

2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

3. All water and steam piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.

4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.

5. All power wiring, including motor starters and disconnects, serving the unit has been completed.

6. All automatic temperature and safety controls have been completed.

7. All dampers are fully operational.

8. All shipping materials have been removed.

9. All (clean) filter media has been installed in the units.

3.5 LEVELING

A. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer's instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

3.6 FINAL INSPECTION AND START UP SERVICE

A. After the Mechanical Contractor has provided all water piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start up.

C. The Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:

1. Record date, time, and person(s) performing service.
2. Lubricate all moving parts.
3. Check all motor and starter power lugs and tighten as required.
4. Verify all electrical power connections.
5. Conduct a start up inspection per the AHU manufacturer's recommendations.
6. Record fan motor voltage and amperage readings.
7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Check coupling for proper alignment.
10. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
11. Disengage all shipping fasteners on vibration isolation equipment.
12. Check safety guards to insure they are properly secured.
13. Secure all access doors to the fan, the unit and the ductwork.
14. Switch electrical supply "on" and allow fan to reach full speed.
15. Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.
16. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
17. Check all control sequences.

END OF SECTION 237313

SECTION 237413 - PACKAGED ROOFTOP UNIT

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Documents.

1.2 SUBMITTALS

A. Packaged rooftop unit and accessories. Installation details. Complete installation drawings, installation and start-up instructions, wiring diagrams, and instruction manuals from manufacturer of equipment.

B. Wiring diagram of control system indicating points for field interface and field connection. Diagram shall fully depict field and factory wiring.

C. Electrical information, to include volts, frequency, number of phases, minimum supply circuit conductor ampacity, the maximum rating of the branch circuit short circuit and ground fault protective device, and the short circuit rating of the motor controllers or industrial control panel.

1.3 QUALIFICATIONS

A. Complete unit and accessories shall comply with the New York State Energy Conservation Construction Code. Unit shall have UL label.

1.4 MANUFACTURER'S WARRANTY

A. 60 months extended warranty for refrigerant system.

2.0 PART 2 – PRODUCTS

2.1 PACKAGED ROOFTOP UNIT

A. General:

1. Provide a complete packaged rooftop unit including fans, compressors, coils, piping and controls. Factory assembled, piped, internally wired, and fully charged with refrigerant ready to operate.

B. Casing:

1. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Unit shall have 2 inch thick Antimicrobial polyisocyanurate foam insulation, metal encapsulated with no exposed edges. Initial R value of 6.6 per inch of thickness. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.

2. The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed.

3. Provide filter rack with 2” thick MERV-8 filters and 2” thick MERV-13 filters as called for on contract documents.

4. Provide outdoor air filter rack for 2” carbon filter.

C. Sound Performance:

1. The AHU manufacturer shall provide sound power levels for AHUs at the octave bands indicated on contract documents. Sound power levels shall be rated in accordance with AHRI standards. Sound power levels at each octave band shall not exceed listed criteria by more than 3 dB In the event that the required levels are not met, the manufacturer shall provide corrective measures to achieve the levels specified in the schedules below, at no additional cost to the Owner.

D. Fan Section(s):

1. Complete with forward or backward curved fans as called for, motor, belts, guards and pulleys.

2. Number and diameter of fans and discharge arrangement as scheduled on Contract Drawings.

3. Adjustable pitch motor pulleys. Fan bearings shall be rated for 50,000 hours B-10 life continuous operation in accordance with AFBMA.

4. Bearing mounting shall be adjustable and self-aligning.

5. Motor mounted on adjustable pivot or slide base.

6. Fan and motor mounted on a vibration isolated steel frame.

E. DX Cooling Coil Section:

1. Drip pan with corrosion-resistant mastic coating with drain connection.

2. Capacity as scheduled.

3. Direct expansion type, ARI rated.

4. Coils designed and tested in accordance with ANSI B9.1.

5. Seamless copper tubing and aluminum fins. Fins of ripple design without a hooked trailing edge.

6. Thermal expansion valve proper for refrigerant used.

F. Compressor Condenser Section:

1. Unit compressors of serviceable semi-hermetic or welded, fully hermetic with crankcase heaters and suitable rubber in shear vibration isolators.

2. Protect cooling with high pressurestat, low pressurestat, loss of charge protection, indoor coil freezestats, and current and temperature sensitive overload devices.

3. Anti-recycle circuit to prevent compressor short cycling as a result of a rapid change in thermostat setting and to automatically prevent compressor restart at least five minutes after shutdown.

4. Protective devices wired through the control circuit to prevent compressor restart until reset.

5. Propeller type upblow outdoor fan with direct driven permanently lubricated motor.

6. Condenser coil, ARI rated, designed and tested in compliance with ANSI B9.1. Seamless copper tubing and aluminum fins.

7. Coils shall have internally enhanced tubing.

G. Hot Gas Reheat:

1. Hot gas reheat capability will be provided for dehumidification control. Provide hot-gas reheat coil at the discharge of the evaporator coil, factory piped. Provide with modulating valve and low pressure switch.

H. Energy Recovery Section:

1. Energy recovery wheel performance shall be AHRI 1060 certified and bear the AHRI certified label. The rotor media shall be light weight and must be made of aluminum. Paper or fibrous media are not acceptable. All surfaces must be coated with a nonmigrating adsorbent layer of desiccant prior to being formed into the media structure to insure that all surfaces are coated and that adequate latent capacity is provided. The desiccant must be a 3A molecular sieve designed for the adsorption of water vapor. The media shall be cleanable by vacuuming the media surface, without degrading the latent recovery. Dry particles up to 800 microns shall pass freely through the media.

I. Controls:

1. Unit to come with terminal strip for control by BMS system.

J. Accessories:

1. Economizer shall be field-installed. The assembly shall include; full modulating 0-100% percent outsider air damper and motors, barometric relief, minimum position setting, preset linkage, wiring harness with plug, and fixed dry bulb control. Solid state enthalpy and differential enthalpy control shall be a factory-supplied, field-installed accessory.

2. Powered exhaust relief shall be used in conjunction with economizer and shall operate whenever the unit draws more than 25% outside air.

3. Roof curb shall be designed to mate with the unit and provide support and a watertight installation. The roof curb design shall allow field-fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements. Curb shall ship knocked down for field assembly and include wood nailer strips.

4. A powered 120 volt, 15 amp, 2 plug convenience outlet shall be factory installed. A service receptacle disconnect shall be installed. The convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker.

K. Additional Requirements

1. Equipment shall be provided with a visible nameplate marked with the manufacturer's name, rating in volts, frequency, number of phases, minimum supply circuit conductor ampacity, the maximum rating of the branch-circuit short-circuit and ground-fault protective device, and the short-circuit current rating of the motor controllers or industrial control panel. The unit motor controllers and/or control panel shall have a Short-Circuit Current Rating (SCCR) as indicated on the schedules. All circuit breakers or fuses packaged with the equipment shall have an interrupting rating of not less than the short-circuit current rating indicated on the schedules.

L. Design Equipment: Trane Horizon

M. Make: Daikin Applied, Trane, JCI/York.

3.0 PART 3 - EXECUTION

3.1 PACKAGED ROOFTOP UNIT

A. Install automatic changeover electronic thermostat and associated wiring. Location per plans.

B. Provide for roof openings and framing as called for. Set and secure curb to roof, and unit to curb. Shim roof curb level. Pipe coil drains to spill to roof, provide "P" trap of proper depth. Install unit in strict accordance with manufacturer's instructions. Coordinate installation with work as part of "Control Systems" Section. Start-Up:

1. Arrange to have equipment manufacturer's technician to verify installation for compliance with manufacturer's recommendations.

2. Arrange to have equipment manufacturer's technician perform start-up of equipment, instruct Owner's Representative in the proper operation of the equipment.

END OF SECTION 237413

SECTION 238116 - SPLIT SYSTEM AIR CONDITIONER

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Split system air conditioner.

B. Manufacturer’s wiring diagrams.

C. Refrigerant piping schematics showing accessories.

1.3 GENERAL REQUIREMENTS

A. Provide units to fit intended use and location as indicated:

1. Capacity, size and arrangement, static pressure, brake horsepower, component parts and accessories as scheduled and/or as necessary to obtain required results and allow for proper maintenance.

2. Unit capacities to be ARI, ASHRAE and AMCA rated.

3. Each size fan to be supplied shall be tested in the manufacturer's laboratory under simulated installation conditions. Ratings based on test, not on interpolated or extrapolated calculation.

4. Guaranteed sound-power level ratings not exceeding those of design equipment.

B. Motors:

1. Furnished by equipment manufacturer.

2. Horsepower as scheduled and type as required for each location and service.

3. Motors shall comply with requirements of Section 230513, "Motors".

2.0 PART 2 - PRODUCTS

2.1 AIR HANDLING UNIT

A. Units shall be completely factory assembled including coil, condensate drain pan, fan, motor, filters and controls in an insulated casing. Units shall be UL listed and C.S.A. certified. Forward curved, dynamically and statically balanced fan with 3 speed direct drive. Fan motor bearing shall be permanently lubricated.

B. Units shall have sheet metal and steel frame construction and shall be painted with an enamel finish. Casing shall be insulated and knockouts shall be provided for electrical power and control wiring.

C. Unit shall have a single refrigerant circuit controlled by a flow control check valve (FCCV). Aluminum fin surface shall be mechanically bonded to 3/8 inch OD copper tubing. Coils shall be factory pressure and leak tested. Filters shall be one inch low velocity semi-permanent type.

2.2 CONDENSING UNIT

A. The condensing unit shall be fully charged from the factory for up to 10 feet of piping. The unit must be designed to operate at outdoor ambient temperatures as high as 115°F. The unit shall be UL listed. Unit casing shall be constructed of heavy gauge, galvanized steel and painted with a weather-resistant powder paint finish.

B. Refrigeration system controls include condenser fan and compressor contactor. High and low pressure controls shall be inherent to the compressor. A factory installed liquid line dryer shall be standard. The compressor shall feature internal over temperature and pressure protection, total epoxy dipped hermetic motor windings, thermostatically controlled sump heater, centrifugal oil pump, and internal spring mounts to reduce vibration and noise. The coil shall be continuously wrapped, corrosion resistant all aluminum with minimum brazed joints. The coil shall be 3/8 inch O.D. seamless aluminum glued to a continuous aluminum fin. The coil shall be protected on all four sides by louvered panels.

2.3 MANUFACTURERS

A. Design Equipment: Trane.

B. Acceptable Make: Daikin, Trane, JCI/York.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in strict accordance with manufacturer's instructions and so as to be compatible with intent of the respective system performance requirements.

B. Hang unit from spring type vibration isolators in strict accordance with manufacturer's instruction.

C. Provide 6" thick concrete pad of sufficient size for outdoor condensing unit.

D. Pipe coil pan drains to nearest floor drain and/or as indicated on Plans. Equip with P-trap.

E. Provide refrigerant piping and accessories to air cooled condensing unit as recommended by equipment manufacturer and in accordance with Section 232000 - Piping Systems and Accessories.

END OF SECTION 238116

SECTION 238210 - HYDRONIC GRAVITY HEATING EQUIPMENT

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawings on gravity heating equipment with color selection chart. Clearly indicate which equipment is being submitted.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment shall be free from expansion, noises and strains. Exposed parts to be cleaned and parkerized or phosphate coated before prime coating or baked enameling. Finish colors as selected from manufacturers standard colors during the submittal process. Factory-boxed and tagged by room numbers. Access doors shall be provided in cabinet at locations of valves, flow balancers and air vents. Verify at site, the space available for each piece of equipment. Top of heating unit enclosures shall be at least 1 in. below top of windowsill. Bottom of heating unit enclosures, unless otherwise called for, approximately 6 in. above floor and above the base molding. Refer to Owner's representative at once, any correction, discrepancy or suggested change in size or location. This Contractor responsible for proper location and size of recesses. Coordinate dimensions from floor to bottom of recess with other trades. Provide framing in recess and shims, if required.

2.2 FIN RADIATION

A. General Requirements:

1. Complete enclosure, continuous supporting channel backplate, heating element, hangers and accessories, as specified and shown on the Contract Drawings.

2. Enclosures to run from wall-to-wall unless otherwise called. Provide necessary corner pieces, end caps, column enclosures, butt trims, wall sleeves, with access doors. Do not leave any enclosure installed without an end trim piece.

B. Heating Element:

1. Hot Water System: Seamless copper tube with non ferrous fins, 125 lbs. minimum hydrostatic test pressure. .020" tube wall thickness, minimum. .020" fin thickness, minimum.

2. Tube mechanically expanded to fin collars for permanent metal to metal contact.

3. Properly support with pitch adjustment. Silent element and pipe support. Locate a maximum of 2'-0" apart. Support shall allow for lateral movement for expansion and contraction of heating equipment.

C. Design Equipment: Sterling.

D. Acceptable Make: Rosemex, Sterling, Trane, Vulcan, Engineered Air

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Each unit isolated with shut-off ball valves to permit servicing. Provide flow balancer for each unit as detailed. Provide trap for each unit as detailed. Contractor responsible for correct end connections and arrangements. Arrange piping accessories and valving fully accessible for servicing. Enclosures fastened to structure with screws or bolts, no nailing allowed. Fasten at 6 in. O.C. Provide air collecting chamber and manual vent on return end of each heating unit on all upfeed hot water installations.

END OF SECTION 238210

SECTION 238216 – COILS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawing on coils.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS – HYDRONIC COILS

A. Provide coils of proper size and rows to fit intended use and capacity as scheduled and specified. Location as shown on Plans. Designed for 125 psi. Same end or opposite end connections as required to fit installation shown on Plans. Vertical mounted coils shall have bottom drain headers. Duct mounted coils shall be equipped with flanges. Tag each coil at factory giving number and location. Coils completely drainable with auxiliary drain headers, if necessary. Minimum 1/2 in. drain and vent connections. Aluminum fins shall be a minimum of .0075 in. thick unless otherwise noted. Coils shall have brazed return "U" bends, bent tubes are not acceptable. Performance certified in accordance with ARI Standard 410.

2.2 REHEAT COILS

A. Tubing shall be 0.025” thick copper and shall have a minimum outside diameter of 5/8” fins shall be of aluminum and wound on tubing individually. Steel headers and galvanized steel casings. Coils shall be tested by subjecting each coil to a minimum air pressure of 250 psig with the coil submerged in water.

B. Design Equipment: Trane.

C. Acceptable Make: Aerofin, Carrier, Daikin Applied, Trane, Heatcraft, Marlo.

2.3 HOT WATER HEATING COIL

A. Non-ferrous heating coils, 125 psi working pressure, designed to relieve expansion and contraction strains. Minimum 16 gauge galvanized casing, non-ferrous or cast iron headers, 0.035” thick copper tubes with 0.035” thick "U" bends, aluminum fins, for coils. Coils tested at 300 psig then leak tested at 200 psig with air pressure under water. Hot water heating coils, serpentine type, number rows and arrangement as called for; same end connections with vent chamber on return end and completely drainable. Provide with turbulators.

B. Design Equipment: Trane.

C. Acceptable Make: Aerofin, Carrier, Daikin Applied, Trane, Heatcraft, Marlo.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in strict accordance with manufacturer's instructions and so as to be compatible with intent of the respective system performance requirements. Provide supporting ironwork and sheet metal safing to assure proper installation without any bypass air around coil.

B. Provide ample space during installation to allow for the removal of the coil. Provide all necessary unions, isolation valves, flexible connectors and accessories to allow for the removal and service of the coil.

C. Provide an access door upstream of all coils for inspection. Access door shall be minimum 16 x 12.

END OF SECTION 238216

SECTION 238219 - FAN COIL UNITS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation as shown on the Contract Drawings.

1.2 SUBMITTALS

A. Room fan coil units and accessories including coil capacities, grille type and filters.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Baked enamel finish of color selected from manufacturers standard colors. Each piece of equipment boxed separately and tagged by room number.

2.2 CEILING TYPE

A. General:

1. Base unit designed for concealed ceiling installation as indicated.

2. Units shall be arranged for horizontal installation above finished ceiling, with supply and return duct connections.

3. With return plenum and filter section

4. Shall not to exceed 35 decibels, 5 ft from units.

B. Cabinets/Consoles:

1. 18 gauge steel enclosure.

2. Tamperproof Cam type locks.

3. Access to motor, fan assembly and filters.

4. Type as required for job conditions.

5. Factory installed air vent tapping.

6. Insulated drip pan for coil and valve sections.

7. Insulated cabinet with material in compliance with NFPA 90A requirements.

C. Heating Coils:

1. Copper tubes and headers, nonferrous fins.

D. Cooling Coils:

1. Copper tubes and headers, nonferrous fins.

E. Motors:

1. ECM motor controller with local speed potentiometer capable of dry contact enable / disable control by BMS.

2. Built-in overload protection.

3. Resilient mountings to dissipate noise and magnetic vibration.

4. Unit mounted and wired multi-speed switch.

5. Quick detachable motor cords.

F. Filters:

1. MERV-8, see 234000 for details.

G. Design Equipment: Trane

H. Acceptable Make: Daikin Applied, Trane, JCI.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Left hand or right hand piping connections for supply and return. Obtain complete instructions from unit manufacturer regarding each item and proper installation of same. Adjust motor speed.

3.2 INSTALLATION

A. In accordance with manufacturer's recommendations. Install piping within valve compartment to allow for pipe insulation. Provide drain piping. Vacuum clean inside of unit prior to operating units. Provide flexible duct connections at supply and return connections to ceiling units.

END OF SECTION 238219

SECTION 238230 - PANEL RADIATION

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation designed in Contract Documents.

1.2 SUBMITTALS

A. Submit shop drawings on panel radiation equipment with color selection chart. Clearly indicate which equipment is being submitted.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide wall hung steel panel radiator elements of lengths and in locations as indicated, and of capacities, style and having accessories as scheduled.

B. All equipment shall be free from expansion, noises and strains. Exposed parts to be cleaned and parkerized or phosphate coated before prime coating or baked enameling. Finish colors as selected from manufacturer’s standard colors during the submittal process. Factory-boxed and tagged by room numbers. Verify at site, the space available for each piece of equipment. Refer to Owner's representative at once, any correction, discrepancy or suggested change in size or location.

C. This Contractor responsible for proper location and size of recesses. Coordinate dimensions from floor to bottom of recess with other trades. Provide framing in recess and shims, if required.

2.2 PANEL RADIATORS

A. Panel Construction:

1. Panel radiation shall be of one-piece all-welded steel construction, consisting of flattened water tubes welded to headers at each end. The radiator shall include an integral heavy gauge (0.09” minimum) all-welded perforated top grille (for curved radiators the grille is omitted).

2. Steel corrugated fins welded to the rear side of the water tubes to increase the convective output of the unit. There shall be no less than 32 fins per foot. Fins shall start within 1” of the headers, and shall be spotwelded three times per tube.

3. The radiator’s headers shall include all necessary inlet, outlet and vent connections as required.

4. Internal baffling is provided where required for proper water flow.

5. Panels shall be available in lengths from 2’-0” to 29’-6” in two inch even increments without the need for splicing.

6. Panels shall be capable of being mounted to typical stud wall construction without additional blocking or strapping. Appropriate wall mounting brackets or optional floor post mounting shall be provided with the radiation.

7. Panel radiation expansion shall not exceed 1/64” per foot of radiation at 215ºF. The installer shall provide adequate expansion compensation for each radiator

8. Panel working pressure shall be 56psi

9. The panel radiation shall be cleaned and phosphatized in preparation for the powder coat finish. The radiation is then finish painted with a gloss powder coat finish, for a total paint thickness of 2-3 mils (0.002” – 0.003”).

B. Design Equipment: Runtal ThermoTouch

C. Acceptable Make: Runtal, Rittling Dunham-Bush.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Each unit isolated with shut-off ball valves to permit servicing. Provide flow balancer for each unit as detailed. Provide trap for each unit as detailed. Contractor responsible for correct end connections and arrangements. Arrange piping accessories and valving fully accessible for servicing.

B. Standard Installation

1. Installation per manufacturer’s written recommendations.

2. Factory flex connectors shall be used where appropriate to provide expansion compensation for the radiators “Runtal-Flex” or equal.

END OF SECTION 238230

SECTION 238239 - CABINET UNIT HEATERS (HYDRONIC AND ELECTRIC)

1.0 PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, equipment and services as required for the complete installation and related work as shown on the Contract Documents.

1.2 SUBMITTALS

A. Cabinet unit heaters.

B. Wiring diagrams, performance data and electrical requirements.

C. Color options and samples for review.

2.0 PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Free from expansion and contraction noises and strains. Fan speed shown on Schedule shall not be exceeded. Each piece of equipment factory-boxed and tagged by room number. Cabinet unit heaters and unit heaters shall have baked enamel finish with color selected by the Architect from manufacturer's standard colors. Rating in accordance with standard test codes adopted jointly by IUGA and ASHRAE.

2.2 CABINET UNIT HEATERS

A. General:

1. Rough-in dimensions must not exceed those of design equipment.

B. Cabinet:

1. Front and exposed parts, 16 gauge furniture steel, all others, 18 gauge steel.

2. Fronts shall be removable for access to interior parts.

3. Recessed or semi-recessed equipment to have four-side overlap, trim strips not acceptable.

C. Fan And Motor:

1. Fans, forward curved, centrifugal type, direct drive from motor shafts.

2. Driven by totally enclosed motor with overload protection and lifetime lubrication.

   a. Integral manual motor starter with disconnect switch.

3. Manual motor starter with disconnect switch provided by factory.

4. Shall be quiet in operation, not to exceed 45 db measured 5 ft. away, at high speed.

5. ECM motor controller with local speed potentiometer capable of dry contact enable / disable control by BMS.

6. Wall mounted low voltage thermostat shall be provided by Temperature Controls Contractor.

7. Permanent filter.

D. Heating Element (Hydronic):

1. Nonferrous construction, copper tube, aluminum fins.

2. Multipass serpentine design for high temperature drop.

E. Heating Element (Electric):

1. Nickel-chrome steel resistance wire embedded in refractory enclosed in steel sheath with spiral wound fins.
2. High limit automatic reset cutout switch wired in series with each element to protect from overheating and located in discharge airstream.
3. Fan delay switch to keep fan in operation until heat in element is dissipated after element is de-energized.
4. Built-in transformer to convert line voltage current to fan, and control voltage if different from line voltage.

F. Hydronic:

1. Design Equipment: Trane.

2. Acceptable Makes: AAF, Airtherm, Dunham-Bush, Daiken, Sterling, Trane, Vulcan, Engineered Air

G. Electric:

1. Design Equipment: Indeeco.
2. Acceptable Makes: AAF, Berko, Markel, Q-Mark, Indeeco

3.0 PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Provide equipment in accordance with manufacturer's printed instructions. Report untrue walls before installation. Report cases where clearance below suspended heaters is less than 7-1/2 ft. Provide clearance for piping and conduit. Support units independent of piping. Support units from building structure, with screws or bolts, no nailing allowed. Be responsible for proper location and size of recesses. Coordinate installation of recessed or semi-recessed equipment in recesses. Provide framing in recess and shims. Use sponge rubber gasket air-seal between front enclosure and wall.

3.2 INSTALLATION - HYDRONIC

A. Provide valves and accessories and arrange to permit servicing. Coordinate correct end connections and coil arrangements.

END OF SECTION 238239

SECTION 260010 - BASIC ELECTRICAL REQUIREMENTS

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of Contract, including all General and Supplementary Conditions, Section 019113 Commissioning Requirements, Division 1 Specification Sections, and Instructions to Bidders apply to this section and all other sections of Division 26, 27, & 28.

1.2 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the governing rules and regulations of federal, state and local governmental agencies.

B. The following is a list of codes and standards that will apply to this project:

1. 2020 Building Code of New York State
2. 2020 Existing Building Code of New York State
3. 2020 Fire Code of New York State
4. 2020 Energy Conservation Construction Code of New York State
5. New York State Department of Labor Rules and Regulations
6. 2017 National Electrical Code, NFPA 70
7. Electrical Safety Requirements, NFPA 70E
8. 2016 National Fire Alarm Code, NFPA 72
9. New York State Education Department
10. Federal Occupational Safety and Health Act - OSHA.
11. Factory Mutual or other Insurance Carrier.

1.3 LICENSING & PERMITS

A. Provide certificate of inspection from Commonwealth Electrical Inspection Services Inc. for all electrical work prior to acceptance of each phase.

B. Apply for and obtain all required permits and inspections, include costs for all fees and charges within bid. Provide third party inspection of all electrical work by a certified inspection agency or approved professional.

C. Refer to General Conditions of the Contract for additional requirements.

1.4 GLOSSARY

ACI	American Concrete Institute
ADA	American Disabilities Act
AGCA	Associated General Contractors of America, Inc.
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
FM	Factory Mutual Insurance Company
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NYS/DEC	New York State Department of Environmental Conservation
NYS/UFBC	New York State Uniform Fire Prevention and Building Code
OSHA	Occupational Safety and Health Administration
UFPO	Underground Facilities Protective Organization
UL	Underwriter's Laboratories, Inc.

1.5 DEFINITIONS

Approved / Approval	Written permission to use a material or system.
As Called For	Materials, equipment including the execution specified/shown in the contract documents.
Code Requirements	Minimum requirements.
Concealed	Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
Design Equipment	Refer to the article, BASIS OF DESIGN.
Design Make	Refer to the article, BASIS OF DESIGN.
Equal or Equivalent	Equally acceptable as determined by Owner’s Representative
Exposed	Work not identified as concealed.
Final Acceptance	Owner acceptance of the project from Contractor upon certification by Owner's Representative.
Furnish	Supply and deliver to installation location.
Furnished by Others	Receive delivery at job site or where called for and install.
Inspection	Visual observations by Owner's site Representative.
Install	Mount and connect equipment and associated materials ready for use.
Labeled	Refers to classification by a standards agency.
Make	Refer to the article, BASIS OF DESIGN.

Or Approved Equal	Approved equal or equivalent as determined by Owner's Representative.
Owner's Representative	The Prime Professional
Prime Professional	Architect or Engineer having a contract directly with the Owner for professional services.
Provide	Furnish, install and connect ready for use.
Relocate	Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
Replace	Remove and provide new item.
Review	A general contractual conformance check of specified products.
Rough-in	Pipe, duct, conduit, equipment layout and installation.
Satisfactory	As specified in contract documents.
Site Representative	Construction Manager or Owner's Inspector at the work site.

Refer to General Conditions of the Contract for additional definitions.

1.6 BASIS OF DESIGN

A. The contract documents are prepared on basis of one manufacturer as "design equipment," even though other manufacturers' names are listed as acceptable makes. If Contractor elects to use one of the listed makes other than "design equipment," submit detailed drawings, indicating proposed installation of equipment. Show maintenance clearances, service removal space required, and other pertinent revisions to the design arrangement. Make required changes in the work of other trades, at no increase in any contract. Provide larger electrical feeders, circuit breakers, equipment, additional control devices and other miscellaneous equipment required for proper operation, and assume responsibility for proper location of rough-in and connections by other trades. Remove and replace door frames, access doors, walls ceilings or floors required to install other than design make equipment. If revised arrangement submittal is rejected, revise and resubmit specified "design equipment" item which conforms to contract documents.

1.7 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, fixtures, panelboards, conduits, and wiring devices. Exact locations are subject to the approval of the Owner's Representative. The general run of electrical feeders, branch circuits, and conduits, indicated on the drawings, is not intended to be the exact routing. Circuit designations, in the form of "Home Runs" on branches, indicate the designation of the branch circuit, the size and the quantity of branch circuit conductors, and the panelboard or interconnection box from which the branch circuit is served.

1.8 QUALITY ASSURANCE

A. Manufactures of equipment shall be firms regularly engaged in the production of factory fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than three (3) years.

B. Suppliers of equipment must have factory trained and authorized personnel for the service of all equipment provided.

2.0 PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. The Materials, products and equipment described in the Bidding Documents establish a standard of required quality, functions, dimensions and appearance that must be met by any proposed substitution.

B. Requests for substitution shall be made only by a Bidder. Requests for substitution from sales representatives, vendors or suppliers are not acceptable.

C. Refer to Division 1 specifications for additional information on Substitutions and associated procedures.

D. Proposed substitutions must be submitted to the Architect/Engineer a minimum of ten (10) days prior to the date for receipt of Bids. Each request shall include the name of the proposed material equipment being substituted, cut sheets, installation drawings, performance and test data and warranties. At that time the equipment or will be evaluated and if determined to be acceptable an Addendum will be issued to all bidders.

2.2 MATERIALS

A. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

B. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems conform to the Specifications.

2.3 U.L. LISTING

A. Equipment shall bear the Underwriter’s Laboratories (UL), or other approved agency listing label. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with the National Electric Code and listed by U.L.

2.4 SHOP DRAWINGS/PRODUCT DATA/SAMPLES

A. Submit Shop Drawings on all items of equipment and materials to be furnished and installed.

B. Submission of Shop Drawings and samples shall be accompanied by a transmittal letter, stating name of project and contractor, number of drawings, titles, and other pertinent data called for in individual sections. Refer to applicable Division 01 Section(s) for additional information and requirements.

C. All products specified in an individual Division 26, 27, and 28 specification sections shall be submitted at the same time and each Division Specification section shall have its own submittal. Number each submittal and do not combine multiple specification sections into a single submittal.

D. Shop Drawings Shall Be Dated and Contain:

1. Name of project

2. Name of prime professional;

3. Name of prime contractor;

4. Associated Specification Section, description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.

5. Incomplete submittals will not be accepted.

6. Indicate deviations from contract requirements on Letter of Transmittal.

E. Corrections or comments made on the Shop Drawings during the review do not relieve Contractor from compliance with requirements of the drawings and specifications.

F. The Contractor is responsible for confirming and correcting all quantities; checking electrical characteristics and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

3.0 PART 3 - EXECUTION

3.1 COORDINATION DRAWINGS

A. Before construction work commences, Contractors for all trades shall submit Coordination Drawings in the form of reproducible transparencies drawn at not less than 3/8" = 1'-0" scale. Coordination Drawings are required throughout all areas for all trades. These drawings shall identify and show resolutions of trade conflicts. Mechanical Equipment Rooms shall be drawn early in the Coordination Drawing process, simultaneous with all other congested areas. Prepare Coordination Drawings As Follows:

1. HVAC Contract will prepare the base plan Coordination Drawings showing all ductwork and all pertinent piping and equipment. These drawings may be sepias of the required ductwork Shop Drawings. The drawings shall be coordinated with cable tray, lighting fixtures, sprinklers, air diffusers, other ceiling mounted items, ceiling heights, structural work, maintenance clearances, electric code clearance, reflected ceiling plans, and other contract requirements. Reposition proposed locations of work after coordination drawing review by the Construction Manager and the Architect. Provide adjustments to exact size, location and offsets of ducts, pipes, conduit, etc., to achieve reasonable appearance objectives. Provide these adjustments as part of Base Bid Contracts. Minor revisions need not be redrawn.

2. HVAC Contract will provide sepia transparencies and/or prints and submit the base plan to all major trades' Contractors.

3. Electrical, Plumbing and Fire Protection Contracts will draft location of piping, raceways, cable trays, light fixtures and equipment on the base plan, indicating areas of conflict and suggested resolutions.

3.2 ELECTRONIC CAD DRAWING FILES

A. The Engineer may provide the Contractor with AutoCAD .dwg or MicroStation .dgn format files for this project with the understanding that these CAD files shall be used for reference purposes only, and not as shop drawings or as-built documents. It is the Contractors' responsibility to provide detailed, coordinated shop drawings and documentation prior to installation. The purpose of the Contractors' coordination shop drawings is to account for all trades and field conditions and identify any conflicts that shall be resolved prior to installation.

B. Any additional cost for changes due to conflicts as a result of the Contractors' failure to provide properly coordinated documents will be the responsibility of the Contractors and not of the Engineer.

C. A request must be made in writing to the engineer with the requested individual files. The contractor will then be sent a CAD Release Form and must sign the form to obtain electronic drawings.

3.3 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for rough-ins with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough-in work. **DO NOT SCALE PLANS**. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the owners representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades to eliminate interference with required clearances for equipment maintenance and inspections.

1. Coordinate work with other trades and determine exact routing of all duct, pipe, conduit, etc., before fabrication and installation. Coordinate with Architectural Drawings. Verify with Owner's Representative exact location of all equipment in finished areas, such as thermostat, fixture and switch mounting heights, and equipment mounting heights. Coordinate all work with the architectural reflected ceiling plans and/or existing Architecture. Mechanical and electrical drawings show design arrangement only for diffusers, grilles, registers, air terminals, lighting fixtures, sprinklers, speakers and other items. Do not rough-in contract work without reflected ceiling location plans.

2. Before rough-in for equipment furnished by Owner or in other contracts, obtain from Architect and other Contractors, approved rough-in drawings giving exact location for each piece of equipment. Do not "rough-in" services without final layout drawings approved for construction. Cooperate with other trades to insure proper location and size of connections to insure proper functioning of all systems and equipment. Obtain written authorization from the Owners representative or other contractor for any “rough-ins” that, due to project schedule, are required before approved coordination drawings are available. Any work installed without written authorization or approved coordination drawings, causing a conflict will be relocated by the electrical contractor at no expense to the Owner.

3. For equipment and connections provided in this contract, prepare rough-in drawings as follows:

   a. Existing equipment being relocated: Measure the existing equipment and prepare drawings for installation in new location.

   b. New equipment: Obtain equipment rough-in drawings and dimensions, then prepare rough-in drawings.

   c. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. In general, ductwork shall be given preference except where grading of piping becomes a problem, followed by piping then electrical wiring. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Owner's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at controllers, motor starters, valve access, and other equipment requiring maintenance and operation. Contractor shall relocate existing work in the way of new construction. VISIT SITE BEFORE BIDDING TO DETERMINE SCOPE OF WORK. Provide new materials, including new piping and insulation for relocated work.

3.4 EXISTING SYSTEMS AND CONDITIONS

A. Prior to beginning work inspect and test all existing electrical systems that will be affected by the work in this contract. Provide a report to the Owner indicating any problems or defects found. If no problems or system defects are submitted, the contractor shall be responsible for correcting problems found at the completion of the project that are determined to be caused by the work of this contract.

B. Inspect the entire work area for defects in the existing construction such as scratches, holes etc. Submit a complete list and photographs of existing damage, to the owner prior to beginning work. If existing damage is not documented the contractor shall repair all damage to like new condition, that is determined to have been caused by the work in this contract.

3.5 ELECTRICAL INSTALLATIONS

A. All installations shall comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.

2. The architect shall control the placement of all wall and ceiling mounted electrical equipment and devices in all rooms with the exception of mechanical and electrical equipment rooms. When drawing details are not available, consult with the Architects representative for actual location.

3. Verify all dimensions with field measurements.

4. Arrange for all chases, slots and openings in other building components that are not indicated on drawings, to allow for electrical installations.

5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

6. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the construction schedule. Pay close attention to equipment that must be installed prior to building enclosure.

7. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

8. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer the conflict to the Architect.

9. Store Materials on dry base, at least 6" above-ground or floor. Store so as not to interfere with other work or obstruct access to buildings or facilities. Provide waterproof/windproof covering. Remove and provide special storage for items subject to moisture damage. Protect against theft or damage from any cause. Replace items stolen or damaged, at no cost to Owner.

10. Set all equipment to accurate line and grade, level all equipment and align all equipment components.

11. All tolerances in alignment and leveling, and the quality of workmanship for each stage of work shall be as required by the manufacturer and subject to approval by the owners representative.

12. All finished equipment surfaces damaged during construction shall be brought to "as new" condition by touch up or repainting. Any rust shall be removed and primed prior to repainting.

13. Workmanship shall be as called for in the "Standard of Installation" published by the National Electrical Contractors Association (NECA).

14. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

15. No electrical equipment shall be hidden or covered up prior to inspection by the owners representative. All work that is determined to be unsatisfactory shall be corrected immediately.

16. All electrical work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

17. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify Owner's Representative before starting that part of the work and install only after his approval. In areas with no ceilings, install only after Owner's Representative reviews and comments on arrangement and appearance.

18. Install access panel or door where units are concealed behind finished surfaces.

3.6 PAINTING

A. This Contract Includes the following :

1. Painting for all cut and patch work performed as part of Division 26, 27, and 28 contract.

2. Painting required for touch-up of surfaces damaged due to the installation of electrical work.

3. Painting as required to repair finish of equipment furnished.

3.7 ELECTRICAL EQUIPMENT CONNECTIONS

A. Provide complete power connections to all electrical equipment. Provide control connections to equipment where indicated on the drawings. Provide a disconnect switch ahead of each piece of equipment receiving an electrical connection in accordance with the latest version of the National Electrical Code . Ground all equipment in accordance with the latest version of the National Electrical Code.

B. Provide all power wiring, electric equipment, control wiring, switches, lights, receptacles, and connections as required for proper equipment operation of Owner-Furnished Equipment and Equipment furnished by other contracts,

C. Refer to Manufacturer's drawings/specifications for requirements of special equipment. Verify connection requirements before bidding and confirm prior to rough-in.

3.8 CLEANING

A. After all tests are made and installations completed satisfactorily:

1. Thoroughly clean entire installation, both exposed surfaces and interiors.

2. Remove all debris caused by work.

3. Remove tools, surplus, materials, when work is finally accepted.

3.9 TEMPORARY FACILITIES

A. Refer to Division 0 and 1 specifications for temporary facility requirements of this contract.

3.10 CONTINUITY OF SERVICES

A. The building will be in use during construction operations. Maintain existing systems in operation within all rooms of building at all times. Refer to "General Conditions of the Contract for Construction" for temporary facilities for additional contract requirements. Schedules for various phases of contract work shall be coordinated with all other trades and with Owner's Representative. Provide, as part of contract, temporary mechanical and electrical connections and relocation as required to accomplish the above. Obtain approval in writing as to date, time, and location for shut-down of existing mechanical/electrical facilities or services.

3.11 START UP AND OWNER INSTRUCTIONS

A. Before acceptance of the work, furnish necessary skilled labor to operate all systems by seasons. Instruct the Owners designated personnel on the proper operation and maintenance of systems and equipment. Obtain written acknowledgment from person instructed prior to acceptance repeat the instructions if asked to do so. Contractor is fully responsible for systems until acceptance, even though operated by Owner's personnel, unless otherwise agreed in writing. Provide, operating, maintenance and starting precautions and procedures to be followed by the Owner for operating systems and equipment. Mount the instruction in clear plastic holder on or adjacent to the equipment.

B. Where supervision by a manufacturer is called for, provide manufacturer’s certified technician or engineer to supervise the startup, testing and adjustment of the equipment or system. Where two or more manufacturers are involved (i.e., variable frequency drive and air handling unit) both manufacturer’s shall be present at start up. The manufacturer shall provide a written report detailing the testing and start-up including problems that occurred and their method of resolution.

C. Refer to Division 01 Specifications and Section 019113 – Commissioning Requirements for additional startup and Contract Closeout requirements.

3.12 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance Manuals. Include one copy each of approved Shop Drawings, wiring diagrams, piping diagrams, spare parts lists, as-built drawings and manufacturer's instructions. Include typewritten instructions, describing equipment, starting/operating procedures, emergency operating instructions, seasonal changeover, freeze protection, precautions and recommended maintenance procedures. Include name, address, and telephone number of supplier manufacturer Representative and service agency for all major equipment items. Bind above items in a three ring binder with name of project on the cover. Provide required number of hard copies and disk(s) containing pdf files of all documents and deliver to Owner's Representative before request for acceptance.

3.13 RECORD DOCUMENTS

A. Prepare record or as-built documents in accordance with Division 01 Specifications. In addition to those requirements provide the following:

1. Document the routing major raceway systems, location of control devices, branch circuit numbers for all devices and equipment and fuse and circuit breaker sizes for major equipment and branch circuit home runs.

2. Provide stamp on each drawings including: Company Name, Date and “Record Drawings”

3. Refer to each Division 26, 27 and 28 section for additional items to be included in the record drawings.

4. Provide required number of hard copies and disk(s) containing pdf files of all documents.

3.14 REMOVALS

A. Where existing equipment removals are called for, submit complete list to Owner's Representative. All items that Owner wishes to retain that do not contain asbestos or PCB Material shall be delivered to location directed by Owner. Items that Owner does not wish to retain shall be removed from site and legally disposed of. Removal and disposal of material containing asbestos and/or PCB's shall be in accordance with Federal, State and Local law requirements. Where equipment is called for to be relocated. Contractor shall carefully remove, clean and recondition, then reinstall. Remove all abandoned piping, wiring, equipment, lighting, ductwork, tubing, supports, fixtures, etc. Visit each room, crawl spaces and roofs to determine total Scope of Work.

B. Completely remove all piping, conduit, controls, and other devices associated with the equipment not to be reused in the new work. This includes all equipment, conduit, junction boxes, devices, panels, and all hangers, including the top connection and any fastenings to building structural systems. Patch, paint and seal all removals, openings and other penetrations in roof, walls, ceilings, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the architectural, structural, mechanical, site, and electrical drawings and specifications for additional facilities to be demolished or handled.

3.15 ASBESTOS RECOGNITION AND PRECAUTIONS

A. The contractor shall be responsible for coordination of all required removal work, coring, cutting and patching with the owners asbestos management plan. Prior to performing such work identify areas containing asbestos. Notify the Owner so that they may make arrangements for abatement and/or containment prior to work proceeding. The contractor shall be responsible for cleaning all areas where asbestos is released due to the failure to coordinate with the asbestos management plan. Refer to Division 1 sections for further requirements.

B. The disturbance or dislocation of asbestos-containing materials causes asbestos fibers to be released into the building's atmosphere, thereby creating a health hazard to workmen and building occupants. Consistent with Industrial Code Rule 56 and the content of recognized asbestos-control work, the Contractor shall apprise all of his workers, supervisory personnel, subcontractors, Owner and Consultants who will be at the job site of the seriousness of the hazard and of proper safeguards and work procedures which must be followed, as described in New York State Department of Labor Industrial Code Rule 56.

C. Refer to division 2 sections for further requirements.

END OF SECTION 260010

SECTION 260100 - BASIC MATERIALS AND METHODS

1.0 PART 1 - GENERAL

1.1 SCOPE

A. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Miscellaneous Supports
2. Access Doors and Panels
3. Fire Stopping
4. Boxes and Cabinets
5. Equipment Pads, Bases and Supporting Devices
6. Identification
7. Arc Flash Hazard Warning Labels

1.2 SUBMITTALS

A. Product data for:

1. Boxes and Cabinets
2. Fire Stopping Materials

1.3 QUALITY ASSURANCE

A. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, and cutting and patching.

B. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

C. Materials specified herein shall comply with the applicable requirements of :

1. The following Articles of the National Electric Code (NFPA 70)

a. 314 - Outlet, Device, Pull and Junction Boxes, Conduit bodies and fittings

b. 312 - Cabinets, Cutout Boxes and Meter socket Enclosures

2.0 PART 2 - PRODUCTS

2.1 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36
2. Cold-Formed Steel Tubing - ASTM A 500
3. Hot - Rolled Steel Tubing - ASTM A 501
4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.2 ACCESS DOORS AND PANELS

A. Steel access doors and frames shall be factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.

B. Construction:

1. Frames:
   a. 16 gage steel with 1 inch wide exposed perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast in place concrete, ceramic tile.
   b. 16-gage steel, perforated flanges with bead for gypsum or plaster wall board.
   c. 16-gage steel with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame for full bed plaster applications.
2. Access Doors:
   a. Provide 14 gage sheet steel flush panel doors with concealed continuous piano hinge factory installed, primed and painted, set to open 175 degrees.
   b. Provide fire rated, insulated flush panel doors, with continuous piano hinge and self-closing mechanism rated for 1 ½ hour “B” labeled, in fire rated partitions.

C. Provide flush, screwdriver operated cam locks on all access doors.

2.3 FIRE STOPPING

A. Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems". The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.

B. Acceptable Manufacturers:

1. Dow Corning Fire-Stop System Foams and Sealants

2. Nelson Electric Fire-Stop System Putty, CLK and WRP

3. Thomas & Betts - S-100 FS500/600

4. Specified Technologies Inc. (STI)

5. Hilti Firestop Systems

2.4 BOXES AND CABINETS

A. Outlet Boxes and Covers

1. General Use Boxes shall be galvanized steel, not less than 1-1/2" deep, 4" square or octagonal, with knockouts. Outlet boxes exposed to moisture, exterior, wet or damp locations shall be cadmium cast alloy complete with threaded hubs and gasketed screw fastened covers. Minimum box size shall be as indicated in Article 314 of the National Electrical Code for the conductors and devices installed. Boxes shall be approved for the environmental condition of the location where they will be installed.

2. Boxes installed in damp or wet locations shall be of rain tight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.

3. Acceptable manufacturers:

a. Steel City

b. RACO

c. Appleton

d. Crouse Hinds

B. Floor Outlet Boxes

1. For in slab new or existing construction locations - Provide flush cover service for power or communications/data as called for. Boxes shall be suitable for carpet or tile applications with suitable flange to match finish. Stamped steel, concrete tight, fully adjustable box for above grade. Cast for below or at grade. Provide with larger knockouts where called for on applicable detail. Complete with expandable cap to prevent ingress of concrete during pour. Provide integrated carpet plate/duplex floor plate and duplex receptacle where called for.

2. For above grade applications - Provide UL listed 2-hour rated poke-thru service with power/data/low-voltage outlets. Cover shall have leveling screws with floor flange. Shall include separate metal sleeve for low-voltage and power. Provide with integrated power and low-voltage connectivity jacks where called for on applicable detail.

3. Flush floor junction boxes shall be recessed cover boxes designed for flush mounting in masonry. Provide checkered plate gasketed cover suitable for foot traffic. Make: O.Z. Gedney Type YR or approved equal.

4. Design Make: Hubbell, Legrand, Wiremold

C. Pull and Junction Boxes

1. Shall be constructed of not less than 14 gauge galvanized steel with trim for flush or surface mounting in accordance with the location to be installed. Provide screw-on type covers. Boxes installed in damp or wet locations shall be of rain tight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.

2. Acceptable manufacturers:

   a. Hoffman

   b. Keystone

   c. Cooper B-Line

   d. Custom fabricated per. NEC and UL guidelines

D. Terminal and Equipment Cabinets:

1. Terminal and Equipment Cabinets shall be code gauge galvanized steel with removable endwalls. Fronts shall be of code gauge steel, flush or surface type (as indicated) with concealed trim clamps, concealed hinges, flush lock, and grey baked enamel finish. Boxes and front shall be U.L. listed and shall be minimum 35"H x 24"W x 6"D. Provide removable insulated plywood terminal board mounted on inside back wall of cabinet.

2. Acceptable manufacturer:

a. Square D "Mono-Flat"

b. Approved equal

2.5 EQUIPMENT BASES, PADS AND SUPPORTING DEVICES

A. Supports, support hardware and fasteners shall be protected with zinc coating or treatment of equivalent corrosion resistance using approved alternative treatment, finish or inherent material characteristic. Products used for outdoor applications shall be hot dipped galvanized.

B. Provide clevis hangers, riser clamps, conduit straps, threaded c clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps as applicable.

C. 14 gauge U-Channel systems with 9/16 inch diameter holes at a minimum of 1 7/8 inches on center in the top surface. Provide fittings and accessories that match and mate channel.

D. Provide carbon steel or wedge or sleeve type expansion anchors, steel spring head toggle bolts and heat treated steel power driven threaded stud fastening equipment as required by construction types.

E. Provided field fabricated supporting devices such as angles, channels, pipe supports, etc. All fabricated supports shall be of metal construction.

F. Acceptable Manufacturers:

1. Allied Tube

2. American Electric

3. B-Line

4. Unistrut Diversified Products

5. Cooper Industries

6. Killark Electric Mfg. Co.

7. O/Z Gedney

8. Spring City Electrical Mfg. Co.

9. Thomas & Betts Corporation

2.6 ROOF PENETRATION FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, EDPM skirts, EDPM hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

B. Design Equipment: RPS.

C. Acceptable Manufacturers: Pate, Shipman & Son.

2.7 IDENTIFICATION

A. Equipment Identification Nameplates

1. Machine engraved, plastic laminated labels, signs and instruction plates.

2. Material: Engraving stock melamine plastic laminate.

3. Thickness:

a. 1/16-inch minimum thick for signs up to 20 square inches or 8 inches in length.

b. 1/8-inch thick for larger sizes.

4. Color:

a. Background: Black

b. Lettering: White

5. Text:

a. Equipment Designation: Helvetica 3/8" lettering.

b. Supplementary Information (i.e. source, location, nominal voltage, etc.): Helvetica 3/16” lettering.

6. Identification nameplates shall be punched and permanently affixed to the equipment via stainless steel mechanical fasteners.

B. Wiring Device Labeling

1. 0.5” tall, plastic, tear resistant, printer tape label.

2. Color: Black text on clear tape.

C. Raceway & Cable Labeling

1. Adhesive marking labels for raceway and metal-clad cable. The labels shall indicate voltage and service, and be located above ceilings every 75 feet and on wall mounted conduit in mechanical and equipment rooms.

2. Colored self-adhesive vinyl tape, minimum 3 mils thick by 1 inch wide for all phase marking on cable.

D. Underground Conduit and Cabling Labeling

1. 6-inch wide, red colored, warning ribbon plastic tape compounded for direct-burial services. Ribbon shall have aluminum backing making it easy to locate using a non-ferrous locator. Ribbon shall include continuous lettering reading "CAUTION BURIED ELECTRIC LINE BELOW" or similar.

2.8 ARC-FLASH HAZARD WARNING LABELS

A. Standard Label for All Electrical Equipment:

1. Multi-colored self-adhesive vinyl label, minimum dimension 5" wide x 3" high.

2. Shall designate the arc flash hazard for equipment in accordance with NFPA 70E.

3. Label shall include the following information:

a. Text reading: "⚠WARNING ARC FLASH & SHOCK HAZARD APPROPRIATE PPE REQUIRED"

b. Nominal system voltage

c. Arc Flash Boundary

d. The arc flash PPE category in accordance with the Arc Flash PPE Categories Method described in NFPA 70E - Table 130.7(C)(15)(a) Arc-Flash PPE Categories for Alternating Current (ac) Systems.

B. Acceptable Manufacturers:

1. W.H. Brady Co.

2. Markal Corp.

3. National Band & Tag Company

4. Panduit Corporation

5. Cole-Flex Corporation

3.0 PART 3 - EXECUTION

3.1 ACCESS DOORS AND PANELS

A. Install access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.

B. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

3.2 FIRE STOPPING

A. Installation of Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be as follows:

1. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for dry wall construction.

2. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.

3. The methods used shall incorporate qualities that permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.

4. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.

3.3 BOXES AND CABINETS

A. Consider location of outlets, wiring devices, motor control equipment and other electrical equipment shown on drawings as approximate only. Study architectural, process piping, mechanical, plumbing, structural, roughing-in, etc., drawings and note surrounding areas in which each outlet or equipment is to be located. Locate outlet and electrical equipment so that when fixtures, motors, cabinets, equipment, etc., are placed in position, outlet or electrical equipment will serve its desired purpose. Where conflicts are noted between drawings, contact Owner's Representative for decision prior to installation. Comply with Article 314 of National Electrical Code relative to position of outlet boxes in finished ceilings and walls.

B. Outlet boxes in separate rooms shall not be installed "back-to-back" without the approval of the Owner's Representative.

C. Outlet boxes shall be sized to accommodate the wiring device(s) to be installed.

D. Outlet boxes installed in plaster, gypsum board or wood paneled walls shall be installed with raised plaster covers or raised tile covers.

E. Outlet boxes installed in tile, brick or concrete block walls shall be installed with extra-deep type raised tile covers or shall be 3-1/2" deep boxes with square corners and dimensions to accommodate conductors installed.

F. Surface ceiling mounted outlet boxes shall be minimum 4" square, 1-1/2" deep, galvanized sheet metal.

G. Surface wall mounted outlet boxes shall be cast type boxes having threaded or compression type threadless hubs. Exterior boxes shall be cast type with threaded hubs and gasketed cover plates secured by non-ferrous screws.

H. Floor outlet boxes shall be installed flush with finished floor, adjust level and tilt as required. Where finished floor is terrazzo, provide boxes specifically designed for installation in terrazzo. Where floors are to receive carpet or tile, provide floor outlet with proper flange. For in existing slab construction locations cut and patch floor as required to install new boxes, devices and all associated raceways.

I. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junction or pull boxes required due to field conditions and size as required by the National Electrical Code.

3.4 OUTLET BOX ROUGH-IN HEIGHTS:

A. Unless otherwise noted, mount devices and equipment at heights measured from finished floor to device/equipment centerline, except fire alarm as follows:

1.	Light switches	46"
2.	Receptacle outlets	18"
3.	Receptacle outlets, above hot water or steam baseboard heaters.	
	Do not install receptacle outlets above electric baseboard heaters.	30"
4.	Receptacle outlets, hazardous areas	48"
5.	Receptacle outlets, weatherproof, above-grade	24"
6.	Secondary Clock	90"
7.	Wall Mounted Public Address Speaker	90”
8.	Horn Type Public Address Speaker	Min. 180”
9.	Large Venue Fire Alarm Speaker	Min. 180”

10.	Data outlets	18"
11.	Telephone outlets, wall mounted	46"
12.	Fire alarm manual station	46"
13.	Fire alarm audio/visual (bottom of device)	80"
14.	Branch circuit panelboards, to top of backbox	72"
15.	Distribution panelboards, to top of backbox	72"
16.	Terminal cabinets, control cabinets	72"
17.	Disconnect switches, motor starters, enclosed circuit breakers	48"
18.	Roof mounted receptacles and disconnect switches	24”

19. Where structural or other interference’s prevent compliance with mounting heights listed above, consult Owner's Representative for approval to change location before installation.

3.5 EQUIPMENT PADS, BASES AND SUPPORTING DEVICES

A. Hangers and Supports:

1. Provide steel angles, channels and other materials necessary for the proper support and erection of motor starters, distribution panelboards, large disconnect switches, pendant-mounted lighting fixtures, etc.

2. Panelboards, cabinets, large pull boxes, cable support boxes and starters shall be secured to ceiling and floor slab and not supported from conduits. Small panelboards, etc., as approved by Owner's Representative, may be supported on walls. Racks for support of conduit and heavy electrical equipment shall be secured to building construction by substantial structural supports.

B. Concrete Pads for Floor Mounted Equipment:

1. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, and securely bond to floor by roughening slab and coating with cement grout.

2. Bases shall be 4" high (unless otherwise indicated); shape and size to accommodate equipment, to extend 4” beyond equipment footprint in all directions. Set anchor bolts in sleeves before pouring. After anchoring and leveling, fill equipment bases with grout.

3. For seismic rated installations provide a minimum of one ½” rebar dowel for every 2 sq. ft. of base area, anchored 2” into floor with non-shrink structural grout.

3.6 IDENTIFICATION

A. Provide equipment identification nameplates on the outside of the enclosure for all equipment indicating the following information:

1. Switchgear, Switchboards, Panelboards, Transformers, Motor Control Centers, Equipment Cabinets, Control Panels, Generators, Uninterruptable Power Supplies:

a. Equipment designation.

b. Source and location of the source.

c. Nominal system voltage.

2. Contactors, Disconnect Switches, Enclosed Circuit Breakers:

a. Equipment designation.

b. Source and location of the source.

c. Nominal system voltage.

d. Location of the load that the switch or breaker serves.

3. Motor Controllers:

a. Motor designation.

b. Type of service.

c. Source and location of the source.

d. Nominal system voltage.

e. Location of the motor.

4. Transfer Switches:

a. Equipment designation.

b. Equipment designation and location of the first downstream distribution device served.

c. Normal and standby/emergency sources and location of the sources.

d. Nominal system voltage.

B. Provide equipment identification nameplates for each circuit breaker in all switchgear, switchboards and distribution panelboards listing the panelboard or equipment load connected to each device.

C. Provide wiring devices labeling of all wiring devices. Labeling shall be attached to the outside of the device face plate. Label shall indicate the following information:

1. Panelboard designation and circuit number from which it originates.

D. Provide permanent black marker labeling on all pull boxes and junction boxes indicating the following information:

1. Power & Lighting:

a. Feeder, branch circuit, and circuit numbers on cover.

b. Source(s) and location(s) of the sources.

c. Load(s) and location(s) of the load(s) served.

d. Nominal system voltage.

2. Systems:

a. System type.

b. Panelboard designation and circuit number from which it originates, if applicable.

c. Equipment location(s) from which enclosed cables originate.

d. Equipment and location(s) of the equipment served.

e. Nominal system voltage.

E. Feeders Circuits, Branch Circuits, Control Circuits:

1. 600-volts and Below:

a. Provide cable tags, wire markers, and phase identification tape as appropriate.

b. Identify circuits in each junction box, pull box, outlet box, enclosure, wireway, manhole, handhole, lighting standard base, and at each termination.

c. Identify with source panelboard, circuit number, load, and location served.

d. Include the identification of the building from which it originates for exterior circuits.

2. Above 600-volts:

a. Cables shall be identified at each manhole, handhole, junction box, transformer, switch, and at each termination using cable tags.

b. Identify nominal voltage, circuit number, circuit size, load served, and equipment designation/location from which it originates.

c. Exposed conduit runs shall be identified continuously reading "DANGER – 4,160 VOLTS" or as appropriate.

F. Underground Conduits & Circuits

1. Provide warning ribbon above the underground electrical installation and 12-inches below finished grade or as appropriate.

G. Empty Conduit Runs and Conduits with Conductors for Future Use:

1. Provide cable tags.

2. Indicate proposed future use.

3. Label conduits and conductors at both ends, including location of another end.

H. Provide complete, typed directory for each panelboard listing the room number, function, etc., for each circuit. Provide updated, typed panelboard directories for all existing panelboards affected by this work.

3.7 ARC-FLASH HAZARD WARNING LABELS

A. Provide a standard arc-flash hazard warning label at all new electrical equipment including but not limited to switchboards, switchgear, panelboards, meter socket enclosures, and motor control centers.

B. Provide an arc-flash hazard warning label at the main service equipment. The design engineer will share the available fault current data with the contractor upon request.

3.8 FLASHING AND SEALING

A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, EDPM skirts, EDPM hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

3.9 CUTTING AND PATCHING

A. Provide all required Cutting and Patching as outlined in the Summary of Work Div. 1 specifications.

B. Provide priming and finish coat of paint on walls and surfaces at locations of removed raceways and equipment locations. The paint finish color and sheen shall match the existing surrounding finish.

C. All penetrations thru masonry walls and floors shall be patched with Sakrete FastSet Non-Shrink 3-hour 2,000 psi Grout or equal.

D. All penetrations thru drywall where electrical materials were removed shall be patched with cores or partial pieces of 5/8" minimum thickness drywall and Qty. (3) sanded coats of drywall compound. This shall be followed by priming and painting.

E. The following requirements apply:

1. Perform cutting, fitting and patching of electrical equipment in all following cases:

   a. To uncover work for installation of poorly coordinated or ill-timed electrical work.

   b. To remove and replace defective work.

   c. To remove and replace work not conforming to requirements of the Contract Documents.

2. Remove samples of installed work as specified for testing.

3. Install equipment and materials in existing structures.

4. Cut, remove and legally dispose of all electrical equipment, components, and materials as called for and all other items not indicated on plans but made obsolete by the installation of new work.

5. Protect the structure, furnishings, finishes and adjacent materials not being removed and maintain temporary

END OF SECTION 260100

SECTION 260519 - LOW-VOLTAGE CABLES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Low Voltage Conductors
2. Type MC Metal Clad Cable
3. Connectors and Terminations

1.3 SUBMITTALS

A. Provide product data for the following:

1. Low Voltage Conductors
2. Type MC Metal Clad Cable
3. Connectors and Terminations

1.4 QUALITY ASSURANCE

A. All conductors shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of :

1. The following Articles of the National Electric Code (NFPA 70)
    a. 300 - Wiring Methods
    b. 310 - Conductors for General Wiring
    c. 330 - Type MC Metal Clad Cable
    d. 400 - Flexible Cords and Cables
    e. 402 - Fixture Wires

2. The following U.L. Standards:

a.	UL 83	Thermoplastic-Insulated Wires and Cables
b.	UL 44	Thermoset-insulated Wires and Cables
c.	UL 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors.
d.	UL 854	Service Entrance Cable
e.	UL 1277	Electrical Power and Control Tray Cables
f.	UL 6, 1981	Rigid Metal Electrical Conduit
g.	All Other Applicable Standards	

2.0 PART 2 - PRODUCTS

2.1 LOW VOLTAGE CONDUCTORS

A. General purpose feeder and branch circuit and control wiring:

1. Annealed Copper, 98% conductivity.
2. Minimum wire size:
   a. #12 AWG for branch circuits
   b. #14 AWG for control and signal circuits
3. Wire shall be stranded per ASTM B8.
4. 600 volt insulation for all wiring above 50 volts.
5. 300 volt insulation permitted for all wiring below 50 volts.
6. Thermal plastic with PVC insulation with nylon jacket.
7. Suitable for wet or dry locations, THHN/THWN-2 90 degree Celsius.
8. 90 degree C maximum operating temperature rating.
9. UL 83 Listed

B. Color Coding

1. Cable outer jackets shall be manufacturer color dyed the entire length for each phase and neutral conductor.
2. Equipment grounding conductors shall be green unless otherwise noted or approved.

3. All conductors shall be color coded according to the following schedule:

Voltage	A PHASE	B PHASE	C PHASE	NEUTRAL
208Y/120V, 3 Phase	Black	Red	Blue	White
480Y/277V, 3 Phase	Brown	Orange	Yellow	Gray
240/120V, 1 Phase	Black	Red		White

*ALL GROUNDING CONDUCTORS SHALL BE GREEN

4. Switched legs shall be identified with the same color insulation as the phase leg.

C. Acceptable Manufacturers:

1. General Cable
2. Southwire
3. Okonite
4. Encore Wire
5. Prysmian

2.2 TYPE MC METAL CLAD CABLE

A. Construction:

1. Stranded or solid copper conductors, each individually insulated, and enclosed in an armor of flexible metal tape.
2. Suitable for wet or dry locations.
3. Suitable for cable tray installations.
4. Do not install direct buried, in concrete, or in the presence of corrosive vapors.
5. Provide with separate integral grounding conductor.
6. Support every 6 feet.
7. MC cable listed for Health Care facilities use per. NEC Article 517.
8. Manufactured and installed in accordance with NEC Article 330.
9. Design Make: Same as building wire.

2.3 LOW VOLTAGE CONNECTORS AND TERMINATIONS

A. Straight Splices, #26 AWG To #10 AWG

1. Nylon Insulated compression butt-splices.

2. 600 volt, 90 degree C rated.

3. Make: Burndy “Insulink”, T&B “Sta-Kon”, or approved equal

B. Straight Splices, #8 AWG and Larger

1. Two way, long barrel, compression type, copper

2. Provide heat shrink tubing over splice.

3. 600 volt rated.

4. Make: Burndy “Hylink”, T&N 54800 Series, or approved equal.

C. Pigtail Splices, #26 AWG to #10 AWG

1. Twist type pressure connector.

2. 600 volt rated, 105 degree C.

3. Size as required for number and size of conductors used.

4. Make: T&B Scotchlock, or approved equal

D. Three Way Splices, #8 AWG and Larger

1. Three way, long barrel, compression type, copper.

2. Provide tape or heat shrink tubing over splice.

3. 600 volt rated.

4. Make: Burndy “Hylink”, T&B 54700 Series, or approved equal.

E. Lug Terminations for Control and Signal Wiring.

1. Nylon insulated fork with compression termination of #26 AWG to #10 AWG.

2. Nylon insulated ring with compression termination for #8 AWG and larger.

3. 300 volt rated.

4. Make: Burndy “Insulug”, T&B “Sta-Kon”, or approved equal.

F. Lug Terminations for Power Wiring

1. Long barrel, compression type, copper body, on hole for #8 AWG to #2/0 AWG.

2. Long barrel, compression type, copper body, two hole, for #3/0 AWG and larger.

3. 600 volt rated.

4. Make:

   a. One-hole lug: Burndy “Hylug”, T&B 54900 Series, or approved equal.

   b. Two-hole lug: Burndy “Hylug”, T&B 54800 Series, or approved equal.

3.0 PART 3 - EXECUTION

3.1 LOW VOLTAGE WIRE AND CABLE

A. General

1. Install cables in raceway as called for after the entire raceway system has been completed.

2. Install splices and connections in accessible outlet, pull, and junction boxes.

3. Insulate all splices and connections with UL Labeled plastic tape, heat shrink tubing, or plastic molded caps.

4. All wiring systems shall be properly grounded and continuously polarized throughout, following the color coding specified.

5. Provide insulated green jacket grounding conductor in each raceway.

6. Provide dedicated white jacket insulated neutral conductor for each individual branch circuit. Shared neutrals are not acceptable.

7. Adhere to NEC de-rating requirements for raceway fill.

8. Provide stranded wire to motors, transformers, equipment, and vibrating machinery.

9. Feeder conductors shall be continuous from point of origin to load termination without splice. If this is not practical, contact the Owner's Representative and receive written approval for splicing prior to installation of feeder(s). Where feeder conductors pass through junction and pull boxes, bind and lace conductors of each feeder together. For parallel sets of conductors, match lengths of conductors.

10. Where multiple conductors are installed in a common raceway they shall be pulled simultaneously. Use of pulling compound or lubricant shall be avoided unless absolutely necessary. Where pulling lubricant is required, use UL approved compounds approved for cable type. Lubricant shall meet all OSHA and Toxic Control Act standards.

Application	Cable Types	Design Make
General Purpose Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon	Ideal – Yellow 77
High Temperature Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Ideal – Yellow 190
Utility Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua – Gel II
Cold Weather Construction & Maintenance	Rubber, Neoprene, Nylon, PVC, High Density XLP, Hypalon, Low Density Polyethylene, Semiconducting Jacket	Aqua – Gel CW

11. Use pulling means including fish tape, cable, rope and basket type grips which will not damage cables or raceways. Use approved mechanical pullers for feeders and branch circuits as required for #6 AWG cable and larger. Do not use mechanical means to pull conductors No. 8 or smaller.

12. Branch circuit conductors installed in panelboards, and control conductors installed in control cabinets and panels shall be neatly bound together using "Ty-Raps" or equivalent.

13. Reconnect branch circuit wiring at panelboards as required to obtain a balanced three phase load on the feeders.

14. Provide conduit seals in explosion proof areas as called for on the plans and as required by the National Electrical Code.

3.2 TYPE MC METAL CLAD CABLE

A. MC cable shall only be permitted for use in 6-feet maximum whips from conduit connected junction boxes above accessible ceiling areas to individual recessed luminaires. Do not daisy chain luminaires with MC cable.

B. Type MC cable may not be used for home runs to panelboards.

C. Type MC cable may not be used for any connections to wiring devices.

D. Type MC cable may not be used for connections to equipment.

E. Type MC cable may not be used for and emergency branch circuits per. Article 517 in the NEC.

F. Support cable per the National Electrical Code. Secure the cable to fixture hangers using nylon or plastic ties.

G. Bending radius shall comply with Article 330.24 of the NEC.

H. Provide insulating bushing at all termination points between the metal sheath and luminaire or junction box.

I. Type MC cable shall not be installed exposed.

3.3 CONNECTORS AND TERMINATIONS

A. Cover un-insulated splices, joints, and free ends of conductor with rubber friction tape or PVC electrical tape. Plastic insulating caps may serve as insulation.

END OF SECTION 260519

SECTION 260526 - GROUNDING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide a complete grounding system meeting or exceeding the requirements of Article 250 of the latest National Electrical Code. Install all raceway systems, including metal conduit, wireways, pullboxes, junction boxes, bus ducts, enclosures, and motors, to provide a continuous ground path with the lowest possible impedance.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Conductors
2. Hardware
3. Ground Rods

1.3 QUALITY ASSURANCE

A. All grounding systems shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The National Electrical Code, Article 250.

1.4 SUBMITTALS

A. None Required.

2.0 PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Exposed grounding conductors such as bars, straps, cables, flexible jumpers, braids, shunts, etc., shall be bare copper unless otherwise called for.

B. Conductors shall be copper, as called for in Specification Section 260519 - Low Voltage Cables.

C. Provide conductors with THHN/THWN insulation. Sizes #6 AWG and smaller shall have a continuous green jacket color. Conductor sizes #4 AWG and larger may have green taped bands at each end, and in all pullboxes.

D. Acceptable Manufacturers:

1. Same as for low-voltage conductors. Refer to Specification Section 260519 – Low Voltage Cables.

2.2 CONNECTORS, CLAMPS, TERMINALS

A. General: Connectors specified are part of a system. Furnish connectors and components, and use specific tools and methods as recommended by connector manufacturer to form complete connector system.

B. Splices:

1. Spring Type (for #10AWG conductors and smaller only):

a. Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s B-Cap, Electrical Products Div./3M's Scotchlok Type Y, R, G, B, O/B+, R/Y+, or B/G+, or Ideal Industries Inc.'s Wing Nuts or Wire Nuts.

2. Indent Type with Insulating Jacket:

a. Rated 150° C, 600V; Ideal Industries Inc.'s High Temperature Wire-Nut Model 73B, 59B.

b. Indent Type with Insulating Jacket: Rated 105° C, 600V; Buchanan/Ideal Industries Inc.'s Crimp Connectors, Ideal Industries Inc.'s Crimp Connectors, Penn-Union Corp.'s Penn-Crimps, or Thomas & Betts Corp.'s STA-KON.

c. Indent Type (Uninsulated): Anderson/Hubbell's Versa-Crimp, VERSAtile, Blackburn/T&B Corp.'s Color-Coded Compression Connectors, Electrical Products Div./3M's Scotchlok 10000, 11000 Series, Framatome Connectors/Burndy's Hydent, Penn-Union Corp.'s BCU, BBCU Series, or Thomas & Betts Corp.'s Compression Connectors.

3. Connector Blocks: NIS Industries Inc.'s Polaris System, or Thomas & Betts Corp.'s Blackburn AMT Series.

4. Resin Splice Kits: Electrical Products Div./3M's Scotchcast Brand Kit Nos. 82A Series, 82-B1 or 90-B1, or Scotchcast Brand Resin Pressure Splicing Method.

5. Heat Shrinkable Splices: Electrical Products Div./3M's ITCSN, Raychem Corp.'s Thermofit Type WCS, or Thomas & Betts Corp.'s SHRINK-KON Insulators.

6. Cold Shrink Splices: Electrical Products Div./3M's 8420 Series.

7. Gutter Taps: Anderson/Hubbell's GP/GT with GTC Series Covers, Blackburn/T&B Corp.'s H-Tap Type CF with Type C Covers, Framatome Connectors/Burndy's Polytap KPU-AC, H-Crimpit Type YH with CF-FR Series Covers, ILSCO's GTA Series with GTC Series Covers, Ideal Industries Inc.'s Power-Connect GP, GT Series with GIC covers, NSI Industries Inc.'s Polaris System, OZ/Gedney Co.'s PMX or PT with PMXC, PTC Covers, Penn-Union Corp.'s CDT Series, or Thomas & Betts Corp.'s Color-Keyed H Tap CHT with HTC Covers.

8. Lugs:

   a. Single Cable (Compression Type Lugs): Copper, one or 2 hole style (to suit conditions), long barrel; Anderson/Hubbell's VERSAtile VHCL, Blackburn/T&B Corp.'s Color-Coded CTL, LCN, Framatome Connectors/Burndy's Hylug YA, Electrical Products Div./3M Scotchlok 31036 or 31145 Series, Ideal Industries Inc.'s CCB or CCBL, NSI Industries Inc.'s L, LN Series, Penn-Union Corp.'s BBLU Series, or Thomas & Betts Corp.'s 54930BE or 54850BE Series.

   b. Single Cable (Mechanical Type Lugs): Copper, one or 2 hole style (to suit conditions); Blackburn/T&B Corp.'s Color-Keyed Locktite Series, Framatome Connectors/Burndy's Qiklug Series, NSI Industries Inc.'s Type TL, Penn-Union Corp.'s VI-TITE Terminal Lug Series, or Thomas & Betts Corp.'s Locktite Series.

9. Acceptable Manufacturers:

   a. Burndy

   b. T & B

   c. Erico

2.3 GROUND RODS

A. Solid copper or copper clad steel cylindrical rods, 5/8 in. minimum diameter, minimum 8 ft. long.

B. Acceptable Manufacturers:

   1. Erico or Approved Equal

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Raceway Systems:

1. All metal supports, cable trays, frames, sleeves, brackets, braces, etc. for the raceway system, panelboards, switchboards, switches, enclosures, starters, controls, etc., which are not rigidly secured to and in contact with the raceway system, or which are subject to vibration and loosening, shall be bonded to the raceway system. Size the bonding conductor in accordance with NEC Article 250, Table 250.122.

2. Terminate rigid conduit at all boxes, cabinets, and enclosures tightly with two locknuts and a bushing.

3. Conduit which runs to or from all boxes, cabinets, or enclosures having concentric or eccentric knockouts which partially perforate the metal around the conduit and hence impair the continuity of system ground circuits shall be provided with bonding jumpers sized in accordance with NEC Article 250, Table 250.122. Connect the bonding jumper between a grounding type bushing on the conduit and a ground bus or stud inside the box, cabinet, or enclosure.

4. Provide bonding jumpers sized in accordance with NEC Article 250, Table 250.122 for all conduit expansion joints.

5. Provide a grounding conductor in all flexible metallic conduit and liquid-tight conduit, sized in accordance with NEC Article 250, Table 250.122.

6. Provide a grounding conductor in all nonmetallic runs of conduit and raceway, sized in accordance with NEC Article 250, Table 250.122.

7. Provide isolated ground conductors of systems as called for on the plans.

B. Transformer Derived Secondary:

1. Solidly ground all transformer neutral conductors and enclosures to building steel, or a cold water pipe 1” or larger in size as called for in Table 250.122 of the National Electrical Code.

2. Provide an equipment grounding conductor from the point of termination back to the ground bus of the serving panelboard, switchboard, or transformer. Do not splice equipment grounding conductors.

3. Provide an equipment grounding conductors from the point of termination back to the ground bus of the serving panelboard, switchboard, transformer, or switchgear.

4. The grounding conductors contained in the interstices of interlocked armor cable shall be connected to the ground bus at every equipment termination point and to each other and to system ground; ground at every splice location.

C. Made Ground Grid:

1. Provide 3 ground rods, 8 feet long, driven on 10 foot centers, with top of rod 12 inches below finished grade, and located as called for on plans.

2. Connect with size #4/0 AWG copper conductors as called for.

3. Connecting conductors shall be located within 6 inches of the top of the ground rod.

4. Provide two size #4/0 AWG grounding conductors from the ground grid to the service entrance ground bus.

5. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to the service side of nearest metallic cold water and/or sprinkler main.

6. Provide one size #4/0 AWG grounding conductor from the ground grid or service entrance ground bus to building steel.

7. Provide molded fusion welds for all below grade connections. Molds shall be new, unused, and shall be replaced when worn or broken.

8. Required ground grid resistance to earth shall be 25 ohms maximum.

3.2 TESTS

A. Grounding:

1. Grounds and grounding systems shall have a resistance to solid earth ground not exceeding following values:

a. For grounding non-current carrying metal parts associated with secondary distribution system: 25 Ohms

2. Providing grounding tests to verify the above values. Add additional ground rods or connections in order to meet these values.

END OF SECTION 260526

SECTION 260533 – RACEWAYS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Galvanized Rigid Steel Conduit (GRS)
2. Electrical Metallic Tubing (EMT)
3. Flexible Metal Conduit
4. Liquidtight Metal Flexible Conduit
5. Innerduct/Electrical Non-Metallic Tubing (ENT)
6. Rigid Non-Metallic Conduit
7. Fittings
8. Surface Raceway
9. Wireways
10. Cable Hangers

1.3 QUALITY ASSURANCE

A. All raceways shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

a. Wiring Methods

b. Cable Trays

c. Electrical Nonmetallic Tubing

d. Rigid Metal Conduit

e. Rigid Nonmetallic Conduit

f. Electrical Metallic Tubing

g. Flexible Metal Conduit

h. Liquidtight Flexible metal conduit and Liquidtight flexible nonmetallic conduit.

i. Surface Metal Raceways and Surface Nonmetallic Raceways

j. Metal wireways and nonmetallic Wireways

k. Outlet, Device, Pull and Junction Boxes, Conduit Bodies and Fittings

2. The following National Electrical Manufacturers Association (NEMA) Standards:

a.	NEMA, RN1	PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
b.	NEMA, TC 3	PVC fittings for use with Rigid PVC Conduit and tubing.
c.	NEMA, TC 6 & TC 8	PVC Plastic Utilities for Underground Installation.
d.	NEMA, TC 9 & TC 10	Fittings for PVC Plastic Utilities Duct for Underground Installation.

3. The following American National Standards Institute (ANSI) standards:

a.	ANSI-C80.1	Electric Rigid Steel Conduit
b.	ANSI-C80.3	Specification for Electrical Metallic Tubing, Steel

4. The following U.L. Standards:

a.	UL 1	Flexible Metal Electrical Conduit
b.	UL 3	Flexible Nonmetallic Tubing for Electric Wiring
c.	UL 5	Surface Metal Raceways and Fittings
d.	UL 6	Electrical Conduit Rigid Metal Conduit, Steel
e.	UL 360	Liquidtight Flexible Metal Conduit
f.	UL 514B	Conduit, Tubing and Cable Fittings

g. UL 651 Schedule 40, 80, Type EB and A Rigid PVC

h. UL 797 Electrical Metallic Tubing, Steel

i. UL 870 Wireways, Auxilliary Gutters and Associated

1.4 SUBMITTALS

A. Provide product data for the following:

1. Surface Raceway

2. Cable Hangers

2.0 PART 2 - PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit

1. Shall be hot-dipped galvanized steel, including threads.

2. Acceptable manufacturers:

a. LTV Steel

b. Triangle

c. Allied Tube

d. Steel Duct

e. Wheatland

B. Electrical Metallic Tubing

1. Electrical Metallic Tubing shall be electro-galvanized steel.

2. Acceptable manufacturers:

a. Triangle

b. Wheatland

c. Allied Tube

d. Steel Duct

e. LTV Steel

C. Flexible Metal Conduit

1. Flexible Metal Conduit shall be constructed of one continuous length of spirally wound, interlocked, zinc coated strip steel. Interior surface shall be free from burrs or sharp edges.

2. Acceptable manufacturers:

a. Anaconda

b. American Flexible Conduit Co.

c. O-Z/Gedney

d. Thomas and Betts

D. Liquidtight Flexible Metal Conduit

1. Flexible Metal Conduit shall be constructed of one continuous length of spirally wound, interlocking zinc coated strip steel. Interior surfaces shall be free from burrs and sharp edges. Provide with a liquid-tight jacket of flexible polyvinyl chloride (PVC).

2. Acceptable Manufacturers:

a. Allied

b. American Flexible Conduit

c. Carlon

d. Thomas and Betts

E. Innerduct/Electrical Non-Metallic Tubing (ENT)

1. This may also be referenced as Innerduct in the contract documents.

2. Size: 1 ¼" diameter corrugated wall flexible tubing unless otherwise indicated on drawings.

3. Shall be UL Listed type CMP (plenum rated), CMR (riser rated), or CMG (general purpose) as required for the installation.

4. Acceptable Manufacturers:

a. Carlon

b. Dura - Line

c. Arnco

d. VikiMatic

F. Rigid Non-Metallic PVC Conduit

1. Extra-Heavy wall conduit: Schedule 80, constructed of polyvinyl chloride, rated for use with 90°C conductors, and UL listed for direct burial and normal above ground use.

2. Acceptable manufacturers:

a. Carlon

b. Thomas & Betts

c. Certainteed

d. Condux

2.2 FITTINGS

A. Non-Hazardous Location Fittings:

1. Rigid galvanized steel fittings shall be fully threaded and shall be of the same material as the respective raceway system.

2. Fittings for PVC coated rigid galvanized steel conduit shall be threaded, hot dipped galvanized, and coated inside and outside with a urethane coating.

3. Fittings for electrical metallic tubing shall have plastic insulated throat type. Connection be single set screw indenter for conduits up to 2" and double set screw indenter for conduits 2" and larger.

4. Fittings for flexible metal conduit shall be center stopped, plastic insulated throat type, U.L. E-11852 listed.

5. Fittings for liquid tight flexible metal conduit shall have zinc plated steel ferrule, compression type with sealing ring.

6. Fittings for rigid non-metallic conduit shall be solvent cemented in accordance with the manufacturer's instructions.

7. Die-cast or pressure cast fittings are not permitted.

8. Provide conduit bodies types, shapes and sizes as required to suit application and NEC requirements. Conduit bodies for installation in conduit systems shall allow in-line pull outlets, make 90° bends, “T” take-offs, etc. Provide matching gasketed covers secured with corrosion-resistant screws.

9. Acceptable Manufacturers:

   a. O.Z. Gedney

   b. Steel City

   c. Thomas & Betts

   d. Crouse-Hinds

   e. Carlon

B. Expansion Fittings

1. Galvanized steel expansion joints for RGS or EMT conduit, PVC for PVC conduit.

2. Minimum 4” movement in either direction.

3. Weatherproof for outdoor applications.

4. At expansion joints in concrete pours, provide Deflection/Expansion fittings capable of movement of ¾” in all directions from the normal**.**

5. Design Make: O.Z./Gedney, Type "AX" (exposed), “DX” (Concrete Pour)

6. Acceptable manufacturers:

   a. O.Z./Gedney

   b. Crouse-Hinds

   c. Appleton

2.3 SURFACE METALLIC RACEWAY

A. One-Piece raceway suitable for (8) #12 AWG conductors or (2) 0.2” O.D. cables

1. Color shall be factory finished white.

2. One-piece steel construction.

3. Surface box w/ matching knockouts as requited at end(s).

4. Design Make: Wiremold 700 Series

B. Two-Piece raceway suitable for up to (9) #12 AWG conductors or (11) 0.2” O.D. Cables

1. Color shall be factory finished white.

2. Two-piece steel construction with single compartment.

3. Nominal 1-3/4” x 7/8” with snap on cover.

4. Surface box w/ matching knockouts as requited at end(s).

5. Design Make: Wiremold 2400 Series

C. Two Channel (Dual Channel) with devices suitable for up to (48) #12 AWG conductors or (50) 0.2” O.D. Cables.

1. Color shall be factory finished white.

2. Two-piece steel construction with removable front cover and divider for power and communications, length as indicated on the drawings.

3. Nominal 4-3/4” x 1-3/4” with snap on matching cover.

4. Provide wiring devices and data/audio/video outlets in the raceway as shown on plans.

5. Design Make: Wiremold 4000 Series

D. Provide miscellaneous boxes, mounting bezels, covers, entrance fittings and supports designed and manufactured by the raceway manufacturer as required making a complete job.

E. Cat.6A and optical fiber installations:

1. Cable entrance fittings shall include 1” min. minimum knockouts.

2. Provide 2” minimum radius fittings.

F. Acceptable Manufacturers:

1. Hubbell

2. Panduit

3. Wiremold

4. Mono-Systems

2.4 WIREWAYS

A. Wireway shall be steel, enclosed type. Provide hinged, JIC sectional NEMA dust resistant, oil tight type where subjected to moisture, in Pump Rooms, Mechanical, Electric and Fan Rooms, exterior walls, Maintenance Shops, and similar locations. Size to meet NEC fill requirements or larger as noted on Contract Documents. Provide knockouts along runs. Provide all elbows, tees, pullboxes, fittings, hangers, reducers, supports, etc., to meet installation requirements.

B. Cover: Screw cover with full gasketing in outdoor installations.

C. Connector: Flanged.

D. Fittings: Lay-in type with removable front; captive screws drip shield in outdoor installations.

E. Finish: Electro-coated ASA-49 Gray Epoxy Paint over Phosphate Primer.

F. Acceptable manufacturers:

1. Square D "Square Duct"

2. General Electric

3. Hoffman

4. Keystone/Rees, Inc.

2.5 CABLE HANGERS

A. Provide prefabricated, zinc coated, carbon steel hangers UL listed to support category 5, 6, 6A, optical fiber cable, and innerduct installations.

B. Hangers shall have open top with spring loaded cable retainer clip.

C. 4” high with rolled vertical and horizontal edges and a 3” deep and 2” wide support flange.

D. Flat bottom profile to reduce cable crushing in center.

E. Stackable with same model hangers below.

F. Provide beam clamps, rod fasteners, flange clips and brackets as job conditions require.

G. Design Make: Mono-Systems H-433-S or Approved Equal

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Size raceways as indicated on the drawings. Where sizes are not indicated, raceways shall be sized as required by the National Electrical Code in accordance with the quantity, size, type and insulation of conductors to be installed.

B. Provide completely independent raceway systems for normal and emergency branch circuits and feeders as required by the National Electrical Code.

C. Paint all new junction and pull boxes on the emergency power branch in a yellow color identifying them as “EMERGENCY POWER” with the panel name that supplies thru them. Label all new emergency power branch raceways at 25-feet intervals with yellow tape and text “EMERGENCY POWER” where no junction or pull boxes are present.

D. Minimum 1/2" trade size for branch circuit and fire alarm wiring.

E. Minimum 3/4" trade size for voice/data outlets, television outlets, and branch circuit "Home Runs" to panelboards.

F. Where cable quantities are identified on drawings provide telecom conduit sleeves and raceways according to the below schedule (Note this table is an estimate and the actual quantity is dependent on the installed cable diameter):

Cat. 6 Cable Qty.	Conduit Trade Size
4 Cables	¾" Conduit
6 Cables	1" Conduit
10 Cables	1¼" Conduit
20 Cables	2" Conduit
70 Cables	4" Conduit

Cat. 6A Cable Qty.	Conduit Trade Size
2 Cables	¾" Conduit
4 Cables	1" Conduit
6 Cables	1¼" Conduit
10 Cables	1½" Conduit
20 Cables	2½" Conduit
70 Cables	4" Conduit

*Refer to specification section 271000 for maximum outside diameter of UTP cabling.

G. Support raceways from building structure and wall construction. Do not support raceways from ceiling systems ductwork, piping, or equipment hangers. Do not support raceways from pre-existing conduit runs, banks, racks, hangers, etc.

H. Support outlet, pull, and junction boxes independently from building structure and wall construction. Do not support from raceways.

I. Install raceways parallel or perpendicular to building walls, floors and ceilings.

J. Install raceways concealed except in the following areas:

1. Mechanical Rooms
2. Electric Rooms
3. Manufacturing areas
4. Garage or maintenance areas
5. Unfinished basements or crawl spaces

K. Provide a code compliant ground path between all outlets and the established electrical system ground.

L. Cut raceways square, ream ends to remove burrs, and bush where necessary.

M. Coordinate all raceway runs with other trades.

N. Do not install raceways adjacent to hot surfaces or in wet areas.

O. Provide expansion fittings with external grounding straps at building expansion joints.

P. Do not install conduit horizontally in concrete block or dry wall partitions.

Q. Arrange neatly to permit access to the raceway, outlet, pull, and junction boxes, and work installed by other trades.

R. If it is necessary to burn holes through webs of beams or girders, call such points to the attention of the Owner's Representative and receive written approval both as to location and size of hole before proceeding with work. All holes shall be burned no larger than absolutely necessary.

S. Core drill, sleeve, and fire stop all penetrations through existing floors.

T. Support all raceways with malleable iron pipe clamps or other approved method. In exterior or wet locations, provide minimum ¼" air space between raceway and wall. Secure raceway within 3 ft. of each outlet box, junction box, cabinet or fitting.

U. Provide conduit seals and explosion proof devices as indicated on the plans and as dictated by the National Electrical Code for all hazardous locations indicated on the drawings.

V. Provide green ground wire in all EMT, flexible conduit, and non-metallic conduit.

W. Do not install voice and data cabling in any surface metal raceway smaller than Wiremold V2400, except single voice outlets where cable runs straight down and no bends occur in raceway.

3.2 CONDUIT

A. EMT conduit is approved for installations in indoor dry locations only.

B. Install with a minimum of bends and offsets. Bends shall not kink or destroying the interior cross section of the raceway. Factory made bends shall be used for raceways 1" trade size and larger.

C. Provide at least one junction or pullbox for each 270 degrees of bends.

D. Plug the ends of each roughed-in raceway with an approved cap or disc to prevent the entrance of foreign materials during construction.

E. Provide UL approved rain-tight and concrete-tight couplings and connectors.

F. Secure within three feet of each outlet box, junction box, cabinet or fitting.

G. Provide a #14 AWG fish wire in all "Spare" or "Empty" conduit runs to facilitate future installation of conductors.

H. Install raceways in concrete floor slabs as follows:

1. All conduit in concrete floor slabs shall be rigid galvanized steel with concrete tight threaded fittings.

2. Provide expansion fittings where conduits cross building expansion joints.

3. Install conduit below the reinforcing mesh.

4. Locate conduits to provide a minimum of 1” of concrete around conduit.

5. Obtain approval from the Owner's Representative prior to installing conduit larger than 1" trade size in concrete slabs.

I. Wherever a cluster of four (4) or more conduits rise out of floor exposed, provide neatly formed 4 in. high concrete envelope, with chamfered edges, around raceways.

J. Provide conduit supports based on the following table:

Conduit Trade Size	Type of Run	Horizontal Spacing in Feet	Vertical Spacing in Feet
½”, 3/4"	Concealed	7	10
1”, 1-1/4"	Concealed	8	10
1-1/2” & larger	Concealed	10	10
½”, 3/4"	Exposed	5	7
1”, 1-1/4"	Exposed	7	8
1-1/2” & larger	Exposed	10	10

K. Where conduits puncture roof, install pitch pockets as required in order that the roof warranty is maintained.

L. Provide (5) five empty ¾” and (1) empty 1-1/2” raceways from each flush mounted panelboard or cabinet to an area above the nearest accessible ceiling space. Make 90^{o} turn above the ceiling, arranged for further continuation of raceway, and cap.

3.3 RACEWAY SYSTEM INSTALLATION:

A. Wiring above and below 600 volts, exterior below grade locations:

1. Schedule 80 Rigid Nonmetallic Conduit direct buried in sand bed envelope w/ Rigid Galvanized Elbows for all grass areas and where indicated on drawings

2. Schedule 40 Rigid Nonmetallic Conduit encased in concrete w/ Rigid Galvanized Elbows in paved areas, areas subject to vehicular traffic and where indicated on drawings.

B. Wiring above 600 volts in interior or exterior, above grade locations:

1. Rigid Galvanized Steel

C. Wiring below 600 volts in exterior, above grade locations:

1. Rigid Galvanized Steel where exposed and for complete Roof Penetration

2. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

D. Wiring below 600 volts, interior above grade locations:

1. Electrical Metallic Tubing where concealed within walls, above ceilings and in unfinished or unoccupied areas.

2. Where unable to conceal in finished occupied areas: Surface Metal Raceway.

3. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

4. Final connections to luminaires: MC cable (6-foot maximum length from EMT conduit & junction box to individual luminaire)

E. Wiring below 600 volts, interior and exterior, above or below grade NEC Class I, II, III locations:

1. Rigid Galvanized Steel

2. Final connections to rotating or vibrating equipment: Liquid Tight Flexible Metal Conduit (4-foot maximum length)

3. Seal-off fittings matching the hazard category

3.4 INNERDUCT/ELECTRICAL NON-METALLIC TUBING (ENT)

A. Provide complete UL listed innerduct raceway system for all fiber optic cable installations.

B. Provide ENT raceway system for all other communication cable and conductor installations as called for in the contract documents.

C. Provide UL firestop assembly where ENT raceway passes thru fire rated assemblies.

D. Each Innerducts UL fire-resistance rating shall match the contained communications cable plenum, riser, or general purpose jacket listing. Always use the most fire-resistant Innerduct type where the work requires adherence to two or more NEC Article 770 and Article 800 installation guidelines.

1. Provide type CMP Innerduct in all duct and plenum installations.

2. Provide type CMR Innerduct in all vertical pathways where the installation pass thru a floor.

3. Provide type CMG or CM Innerduct in all single floor installations, basements, and attics not used by plenum air systems.

3.5 SURFACE RACEWAYS

A. Support with expansion anchors, concrete inserts, masonry inserts or toggle bolts as field conditions require. Provide supports at five foot centers.

B. Install a separate green ground conductor in raceway from the junction box where surface raceway begins to the ground terminal of the device, fixture or equipment being supplied.

C. Provide all fittings, connectors, elbows, tees, boxes etc. as required for the installation.

D. Submit factory drawings detailing the installation. Include a complete part list.

END OF SECTION 260533

SECTION 260543 - EXTERIOR PATHWAYS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. Cut, excavate, and patch existing asphalt parking lot and grass areas for new underground raceway installations as called for on the drawings.

C. Refer to section 260533 Raceways for raceway requirements.

1.2 SCOPE OF WORK

A. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:

1. Pipe Bollards and Sleeves
2. Trenching and Excavation
3. Ordinary Fill and Crushed Stone
4. Geotextile Fabric
5. Soil Restoration and Seeding
6. Asphalt Paving
7. Underground Raceway
8. Raceway Waterstop Sealant
9. Handholes

1.3 SUBMITTALS

A. Product data for:

1. Bollard Sleeves
2. Manholes, Vaults, and Handholes
3. Asphalt Pavement Supplier and aggregate composition

1.4 QUALITY ASSURANCE

A. The installation shall comply with the applicable sections of the BICSI “Customer Outside Plant Design Manual.”

B. The contractor shall engage the services of a qualified installer for all excavation and restoration work.

C. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.5 PROJECT CONDITIONS AND REQUIREMENTS

A. The following conditions apply to excavation:

1. Identify and maintain and protect existing building services which cross the excavation area.

2. Protect utilities, sidewalks, structures, pavements and other facilities from damage caused by settling, lateral movements, undermining, washouts and other hazards created by excavation work.

3. Locate and verify existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.

4. Verify subsurface conditions prior to excavation work.

B. Obtain as built drawings from the owner for all previous underground work done on the campus. Field verify location of the existing underground utilities and cabling that is shown on these plans. Use tracing equipment as required.

C. The contractor shall be responsible for the repair all existing utilities that are identified on existing as built drawings or construction documents that are damaged during the installation of contract work.

D. The contractor shall sub contract a qualified mechanical or plumbing contractor to repair any underground piping that is damaged as a result of the installation of contract work.

2.0 PART 2 – PRODUCTS

2.1 PIPE BOLLARDS AND SLEEVES

A. Pipe Bollard

1. Schedule 40 Galvanized Rigid Steel

2. Design Make: Refer to Section 260533 Raceways

B. Bollard Sleeve

1. Shall be made of ¼" nominal wall thickness high density polyethylene thermoplastic (HDPE), PVC is not acceptable.

2. Top shall be domed.

3. Inside diameter 5” to fit over 4” pipes.

4. Height: min. of 52”

5. Color shall be selected by owner and approved by Architect. Available colors shall be blue, red, yellow, white, brown, orange and grey.

6. Design Make: Ideal Shield

7. Acceptable Manufacturers:

a. Global Industries

b. Ideal Shield

c. ULINE

2.2 ORDINARY FILL AND CRUSHED STONE

A. Sand: Clean, coarse, free of organic matter.

B. Type 1 Fill (NYSDOT Type 1 / Granular Fill) graduation requirements:

Sieve No.	Percent Passing Maximum	Percent Passing Minimum
3 in.		100%
2 in.	90%	100%
¼” in.	30%	65%
#40	5%	40%
#200	0%	7%

C. Type 2 Fill (NYSDOT Type 2 / Crushed Ledge Rock Stone) graduation requirements:

Sieve No.	Percent Passing Maximum	Percent Passing Minimum
2 in.		100%
¼” in.	25%	60%
#40	5%	40%
#200	0%	7%

D. Gravel Fill: Well-graded natural inorganic sand and gravel conforming to following graduations:

Sieve No.	Percent Passing Maximum	Percent Passing Minimum
4 in.		100%
1 in.	100%	60%
#4	85%	25%
#16	60%	10%
#50	30%	4%
#200	5%	

E. Pea Gravel: Rounded stone, 3/4 in. maximum diameter, and 1/8 in. minimum diameter. Stone crushings of 1/8 in. to 1/2 in. meeting ASTM C33, Paragraph 9.1 may also be used.

F. Ordinary Fill: Well-graded, natural inorganic soil, meeting the following requirements:

1. Free of organic and other compressible materials, debris and frozen materials, and of stones larger than 4 in. maximum dimension.

2. Be of such nature and character that it can be compacted to the specified densities.

3. Free of highly plastic clays, of materials subject to decay, decomposition, or dissolution, and of cinders, ash and other corrosive materials.

4. Maximum dry density of not less than 115 lbs. per cu. ft.

5. Material from excavation on the site may be used as ordinary fill if it meets the above requirements.

2.3 GEOTEXTILE FABRIC

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric

B. 5.6 oz per. yard nonwoven polypropylene fabric minimum, composed of fibers formed into a stable network so that fibers retain their relative position.

C. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

D. Color: blended black and/or dark grey

E. Tested in accordance with the following ASTM standards: ASTM D4355, ASTM D4491, ASTM D4533, ASTM D4632, ASTM D4751, ASTM D5261, ASTM D6241

F. Nominal Roll Size: 8-feet wide x 100-feet long

G. Design Make: Duraweb Model 23245 or Approved Equal

2.4 SOIL RESTORATION AND SEEDING

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

1. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed.

2. Sun and Partial Shade: Proportioned by weight as follows:

a. 33 percent Kentucky bluegrass (Poa pratensis).

b. 33 percent chewings red fescue (Festuca rubra variety).

c. 34 percent perennial ryegrass (Lolium perenne).

B. Native Topsoil: To the extent possible, utilize existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site.

1. Verify suitability of native surface topsoil to produce viable planting soil.

2. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

3. Topsoil shall be screened off the field site to remove particles larger than 2 inches.

C. Imported Topsoil: Provide imported topsoil or manufactured topsoil from off-site sources that complies with NYSDOT Section 713.01, as necessary to meet the project needs.

1. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.

2. Topsoil shall be free of roots, plants, sods, stones, clay lumps, particles larger than 2 inches, and other extraneous materials harmful to plant growth.

2.5 ASPHALT PAVING

A. Use locally available materials exhibiting satisfactory record of previous installations.

B. Provide paving fabric where used over existing paving. Fabric shall be non-woven polypropylene fabric precoated with rubberized asphalt and protected by release sheet. Design Make: Phillips Fibers Corp. “Petrotac precoated Nonwoven Fabric” or Approved equal.

C. Asphalt Requirements:

1. Foundation Course: Provide 6” layer compacted in 3” increments. Material shall comply with NYS DOT Standard Type 1 Fill.

2. Base Course: Provide 2” compacted layer or additional material until movement in front of roller ceases. Material shall comply with NYS DOT Standard Type 2 Fill.

3. Tack Coat: Emulsified asphalt, slow setting type, NYS DOT Designation 702-3601 (SS-1h) or 702-4501 (CSS-1h).

4. Asphalt Cement Filler: NYS DOT Designation 702-05.

5. Asphalt Concrete Binder Course: Provide minimum 3” binder course. Material shall be hot plant mixed asphalt concrete complying with NYS DOT Type 3 Binder.

6. Asphalt Concrete Top Course (over existing paving): Provide minimum 1 ½” top course up to 3” to achieve level surface. Material shall be hot plant mixed asphalt concrete complying with NYS DOT Type 7 Top.

D. Painting:

1. Pavement marking paint shall comply with NYS DOT standard 727-01.

E. Compaction Equipment:

1. Provide Compaction equipment in suitable size and number, and in satisfactory working condition to complete construction on schedule.

2. Use Self-propelled tandem roller with minimum 10-ton weight. Hand held compactor may be used in areas inaccessible to rollers when approved in advanced by engineer.

2.6 MANHOLES, VAULTS, AND HANDHOLES

A. Cover and Frame Requirements

1. General:

a. Cover shall have (2) pick holes on opposite sides

b. Cover shall be labeled “Electric” or “Communications”, as indicated on drawings for indicated use.

2. Concrete Type Structures:

a. Grading Rings shall be HDPE construction, available in 1.25 thru 4” thickness.

b. Diameter 24” thru 36”, size as indicated on drawing.

c. Designed for H-20 loading, AASHTO M306 certification

d. Frame shall have (4) bolt holes, reversible type, 4” high

e. Frame and Iron construction: Grey Cast Iron ASTM-A48 Class 35B

3. Polymer Type Structures:

a. (2) stainless steel bolts to secure cover

b. ANSI TIER 15 Rating for driveway, parking lot, and off-roadway applications subject to occasional nondeliberate heavy vehicular traffic.

c. Skid resistant surface on cover

B. Concrete Handhole Structures

1. Accessories: Include Grading Rings shall be HDPE construction, available in 1.25 thru 4” thickness.

2. Specifications:

a. Concrete: 5000psi @ 28 days

b. Entrained Air: 5-9%

c. Design Load: AASHTO H20

d. Reinforcing: Steel rebar ASTM A615

3. Refer to details on drawings for additional information and size requirements.

4. Acceptable Manufacturers: Lakelands Concrete, Kistner Concrete, Utility Structures Inc.

C. Polymer Concrete Handholes

1. Refer to details on drawings for additional information and size requirements.

2. Construction: Select-grade aggregates in combination with a polymer resin system and fiberglass reinforcement.

3. ANSI TIER 15 Rating for driveway, parking lot, and off-roadway applications subject to occasional nondeliberate heavy vehicular traffic.

4. Stackable construction, minimum total depth shall be 36”.

5. Factory knockouts on each side accept up to 4” raceway

6. Include solid bottom section on base of stacked assembly

7. Acceptable Manufacturers: Hubbell Quazite PD Style or Approved Equal

2.7 UNDERGROUND RACEWAY

A. Underground straight length conduit sections shall be 4” trade size Sch. 80 PVC.

B. Provide 45-degree and 90-degree Galvanized Rigid Steel (GRS) large radius (36”) sweeps at bend locations. Provide PVC to GRS adapters as required.

C. Couplings shall be mechanically or chemically sealed water tight.

D. Provide deflection joint to allow ¾" movement in all axis, and a total bend of up to 30 degrees. Provide fixed galvanized steel bends or flexible metal conduit bends to allow changes in direction. Fixed or flexible bends shall be provided with factory installed reverse spin coupling. Fixed or flexible bends shall have Nylon 6 innerduct to prevent "burn through" due to friction when tapes, ropes, or cables are installed.

2.8 RACEWAY PENETRATION SEAL KIT

A. Suitable for use in water, direct ground burial and atmospheric conditions. Provides electrical isolation where cathodic protection is required.

B. Compression Element: EPDM (Black) Plates

C. Pressure Plates: Reinforced Nylon Polymer

D. Bolts & Nuts: 316 Stainless Steel

E. Temp. Range: -40 to +250ºF (-40 to +121ºC)

F. Design Make: Link-Seal Model “C” or “L” Modular Seal

2.9 RACEWAY WATERSTOP SEALANT

A. Flowable mixture expands and hardens to a semi-permanent, but removable, seal. The foam wets and adheres to metals, plastics, and concrete. It conforms around complex cable fill configurations to keep out moisture, gases, dust, insects, and rodents.

B. Holds 22 feet (6.7 m) of water head pressure and up to 90-foot (27 m) surges.

C. Seal conduits from 2” to 5” with conductors and is re-enterable.

D. Compatible – Use with a wide range of cable jacket and conduit materials.

E. Solves Critical Application – Class 1, Div. 2, cold storage entrances approximate R-Value of 6.5/inch.

F. Design Make: Polywater FST Foam Duct Sealant or Approved Equal

3.0 PART 3 - EXECUTION

3.1 PIPE BOLLARDS AND SLEEVES

A. Provide concrete base for pipe bollard per. detail

B. Trim bollard sleeve as required to be 2” below grade

3.2 EXCAVATION AND TRENCHING

A. Preparatory Work:

1. Build lines to grade and elevations shown. Provide stakes, grade boards, cleats, nails, instruments. Locate and stake each new run for its entire length. Verify elevations given. Start excavation at low point. Notify Engineer of elevation discrepancies. Protect marks and stations. Before excavating work, coordinate with Owner's Site Representative and other trades. Furnish schedule of operations to Owner and each trade. Provide and maintain temporary bridges, walks and bridges over excavations where underground utility lines, sewers, water lines, etc., cross access roads, walks, and streets. Make necessary arrangement with authorities having jurisdiction.

2. Examine substrates, areas and conditions, with the installer present, for compliance with requirements for installation tolerances and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Protection:

1. Provide bracing, shoring, sheathing and other work for: protection of personnel, the contract work, excavations, trees, shrubs, existing structures, and surrounding properties. Slope sides of excavations to comply with local codes and ordinances. Provide, erect, and maintain barricades, warning signs, flags, and lights to provide protection for work, workmen, public, and property. Plank walks, pavements, and curbs to be crossed by equipment. Protect adjacent property, existing fences, trees, shrubs, roads, curbs, sidewalks, manholes, hydrants, and other items:

2. Restore, repair, rebuild or replace any such items damaged or destroyed to condition equal to that existing before such damage occurred.

3. Establish conditions, before starting work, by taking photographs to determine state to which existing conditions must be restored. Submit such photographs notarized, identified and dated for record.

C. Existing Utilities:

1. There are existing underground district electric and telephone utilities. Obtain the districts existing site utility plans for each building prior to beginning work. Identify utilities shown on the plans.

2. The existing district owned telephone cables are not documented. Prior to beginning any excavation work, identify the path of the existing cables using cable tracing equipment.

3. If existing telephone or electric cables are broken during the new installation the contractor shall repair to new condition.

4. Report immediately any utility lines encountered.

5. Notify Underground Facilities Protection Organization (UFPO), where same exists, before starting work. Phone (800)-962-7962 for information and location of nearest organization address and telephone number. Verify exact location of existing utility lines where work crosses existing utilities and where connections are to be made by test hole before starting work. Notify utility companies, municipalities, and other involved jurisdictions when excavation occurs within vicinity of existing underground service such as sewers, water, electric, gas, telephone, including such services owned by Owner.

6. If existing service lines, utilities and utility structures which are to remain in service are uncovered or encountered during this excavation, they shall be protected from damage, and securely supported as directed and approved by the involved jurisdiction. Comply with Section 1918 of Penal Law of State of New York with regard to work in vicinity of combustible gas piping. Immediately report damage or injury to utility lines to Owner's Representative and involved jurisdiction. Repair or replace utility lines damaged or injured as directed and approved by the involved jurisdiction. Excavate by hand in proximity to existing underground utility lines; take extreme care when excavating around ductbanks carrying energized cable. Remove plug or cap inactive or abandoned utilities encountered during construction operations. The location of such utilities shall be noted on the record drawings. Verify "inactivity" of services with involved jurisdiction before start of work.

D. Cutting and Patching

1. Before starting work, obtain necessary permits and pay fees and charges for same. Cut paved areas as called for, perpendicular to surface and in straight saw-cut lines. Replace pavements, roadways, streets, blacktop areas, walks, disturbed by excavating operations with materials equal to adjacent pavements.

E. Methods

1. Provide for buried work in contract both inside and outside of building. Excavate to proper depth and width for installation work as called for and comply with rules set forth by New York State Department of Labor. Remove materials including masonry work, rubble, earth, brickwork, concrete, sand, debris, abandoned pipe lines, drains and sewers, rocks, boulders, and concrete, all of which is considered "earth excavation." Provide for legal disposition of excess excavated materials. Make allowance for gravel fill, sand bases, form work, floor slabs, manholes, anchor and thrust blocks, sheet piping, drainage pumps, and work space. Start excavation at rough grade and provide form work and sheet piling where required.

2. Trench excavation:

   a. By open cut, to proper depth and grade no wider than required for placement of work and not more than 100 ft. in advance of utility being installed.

   b. Should trench bottom be wet, unstable, and/or otherwise incapable of supporting the contract work, immediately report same to Owner' Representative. Should it be deemed unsuitable, excavate to depth as directed and back fill with gravel to trench depth, or provide concrete cradling.

   c. Should rock be encountered, excavate 6 in. deeper and fill space between trench bottom and pipe with coarse sand, well tamped to form firm bed.

F. Backfill and Geotextile Fabric

1. After excavation to sub-grade for all new equipment pads and trenching where indicated on drawing; install Geotextile fabric level and extending to sub-grade excavation and to envelope new backfill. Pin geotextile fabric 18” O.C. around perimeter and on vertical wall faces.

2. Provide bedding around piping with coarse sand from 6 in. below to 8 in. above. Apply by hand and compact under and at sides by mechanical means

3. Piping, jackets and sand bed must be inspected and tested prior to backfill of any nature. Provide necessary anchors, thrust blocks, for testing.

4. Fill remainder of trench in 12 in. layers, use ordinary fill material, except as otherwise specified. Do not use frozen material. Remove boulders, stones, broken rock, wood, bricks, blocks, and debris from fill material before backfill operation.

5. Under roadways, manholes, drives, parking areas, walks, slabs, on grade and at utility entrance to building provide backfill in 6 in. layers with gravel or crushed stone, free from organic or other unsuitable material, to grade. Thoroughly compact each layer.

6. Compaction to not less than 95% density compared to maximum laboratory tests by weight, per modified ASTM D1557-64T, latest editions, method "A" under slab on grade, roadways, drives, and other paved areas and 85% for general grading. Submit certified results of tests by an approved soil testing laboratory.

G. Paving

1. Compact each individual material layer as specified.

2. Adjust grading of finish coat to match surrounding surfaces.

3. Finished surface shall be free from depressions, footprints, or imperfections that may collect water or are clearly visible.

4. Repair and repaint of traffic control and parking lot lines to match existing.

H. Removal of water

1. Provide pumps, hoses, pipe, labor and fuel, necessary to keep excavations free of water accumulation. Maintain and operate equipment. Discharge water in manner not interfering with any trade's work and not to undermine or disturb existing or adjacent structures or land. Grade to prevent surface water from flowing into all excavations and trenches. Do not discharge dirt, backfill, debris, into sanitary or storm drainage systems.

I. Rock Excavation

1. Rock Excavation defined as:

a. Ledge rock requiring blasting or air hammer for removal.

b. Boulders in excess of 1-1/2 cu. yds. in size. Demonstrate that material in question cannot be removed with a 1-1/2 yd. backhoe or shovel.

c. Procedure: Should rock be encountered, remove only upon written order of the Owner’s representative.

2. Measurement of rock excavation, for purpose of payment to Contractor, will be taken 1 ft. wider than ductbank, manhole, pipe or conduit being installed. No allowance made for additional rock taken out accidentally or for convenience of Contractor beyond amount required for installation of work. Rock excavation claimed must be measured each day and verified by Owner's Representative. Maintain daily accounting. No claim for extra compensation honored except through procedures outlined above.

J. Job completion:

1. On completion of the work, clean the entire site, remove surplus earth, large stones and debris, to off-site legal disposal. Remove tools and equipment and leave the entire area in a neat condition.

2. Rough grade to 6 in. below finished grade. Scarify subsoil to depth of 2 In. to achieve bond between topsoil and subsoil.

3. Repave, reseed and completely restore the area to the condition prior to the start of excavation and trenching work.

3.3 UNDERGROUND RACEWAYS

A. Where raceways and/or ductbanks penetrate foundation, footings or outside walls, provide rigid metallic conduits with expandable rubber shields shall be used.

B. Where raceways enter manholes, they shall be centered as nearly as possible to the center between roof and floor and end walls.

C. Securely tie raceways in place to prevent floating.

D. Provide Raceway Waterstop Sealant in all new raceways installed into buildings or structures.

E. Pull iron-shod mandrel not more than ¼" smaller than bore of raceway to remove concrete and other obstructions. Clean raceway by drawing cylindrical brushes through duct.

F. Provide metallic elbows where conduits rise out of ground.

G. Provide nylon pull strings in all innerducts and individual pathways inside raceways.

H. Seal all conduits watertight prior to backfill.

I. Provide bushings at each conduit termination.

J. In locations where non-metallic raceways are used, change to heavy wall metallic conduit of same internal diameter before rising out of ground; provide metallic conduit elbows at conduit rise.

K. Place conduit in straight lines. Place direct-bury conduit tier-by-tier method, backfilling each layer to achieve proper spacing. Elbows shall have a minimum radius of 36 in. Follow proper low temperature installation procedures as recommended by PVC conduit vendor. Repair or replace all existing utilities and facilities damaged, due to new installations as part of contract.

L. Provide a bushing at each conduit termination unless fitting at box where conduit terminates has hubs designed in such a manner to afford equivalent protection to conductors. Provide grounding type insulated bushings on all conduit sizes 1-1/4" trade size and larger, and on all feeder raceways regardless of size.

3.4 LANDSCAPE RESTORATION AND INSTALLATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by sod clearing operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Install weed-fabric and geotechnical fabric installations after sub-grading is complete. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before back-fill or plantings. Make minor adjustments as required.

D. Apply nonselective, pre-emergent herbicide that inhibits growth of grass and weeds.

E. Place indicated thickness of stone, fully covering weed barrier. Rake mulch to a uniform surface level with adjacent finish grades

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

2. Do not use wet seed or seed that is moldy or otherwise damaged.

3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 4 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

F. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 TURF RESTORATION

A. Restore all turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.

2. Install new topsoil as required.

B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

C. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

D. Mow, dethatch, core aerate, and rake existing turf.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

H. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

3.7 MANHOLES, VAULTS AND HANDHOLES

A. Locate to avoid unnecessary hazards and cause minimum interference with normal traffic flow. Locate outside traveled parts of road wherever possible.

B. Where possible conduits entering manholes and handholes shall include a bell mouth fitting. Use center conduit entrances and factory knockouts to underground structures.

C. Seal all conduits watertight at entrances to buildings after manhole and handhole connections.

D. Provide grading rings in 1.25 thru 4” thickness to adjust frame and cover height to finished grade on top of concrete handholes and manholes.

E. Adjust cover and finished grade for flush installation after settlement.

END OF SECTION 260543

SECTION 260620 - WIRING DEVICES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Receptacles
2. Switches
3. Boiler Shutdown Switches
4. Electric Hand Dryers
5. Coverplates

1.3 QUALITY ASSURANCE

A. All wiring devices shall be installed neatly, and parallel with building lines. Recessed devices shall be flush with the face of the wall. Provide extension rings on outlet boxes as required. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.4 SUBMITTALS

A. Provide product data for all wiring devices and cover plates.

B. Indicate selected part numbers.

C. Indicated selected color selections.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Wiring devices shall be specification grade or heavy duty as a minimum. Standard commercial grade is not acceptable.

B. Wiring device color shall be white.

C. Suitable for installation in a 2-1/2” deep outlet box.

D. All receptacles and switches shall be from the same manufacturer.

E. Acceptable Manufacturers:

1. Hubbell
2. Pass & Seymour/Legrand
3. Arrow Hart
4. Eaton
5. Bryant

2.2 CONVENIENCE DUPLEX RECEPTACLES

A. 125 volt, 20 ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

B. Side and back wiring.

C. 0.32” thick brass three prong power contacts and #8 brass screws

D. Brass center rivet

E. All brass grounding system

F. Nylon face with glass reinforced nylon back

G. Dielectric Voltage withstands 2,000V minimum

H. Terminals Identified in accordance with UL 498

I. Tamper-Resistant

J. UL 94V-2 Flame rating

K. Design Make: Hubbell 5362TR Series

2.3 USB CHARGING RECEPTACLES

A. Décor Style

B. Commercial Grade USB Charger Outlet: (2) Type-C port configurations, high power 5 Amp, 5 Volt USB output, Tamper-Resistant duplex receptacle, USB ports rated 10,000 cycles.

C. Duplex 125 volt, 20 ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

D. LED indicator lamp to show USB power is available.

E. Tamper Resistant

F. Meets UL94 and complies with USB BC1.2

G. Design Make: Hubbell USB20C Series

2.4 GFI RECEPTACLES

A. 125 volt, 20 ampere, two pole, three wire, grounding, straight blade, NEMA 5-20R.

B. LED trip/test indication

C. Tamper Resistant

D. Side and back wiring.

E. Nylon face and back.

F. 2006 UL 943 revisions including “no power to the face when miswired” and “end of life indication” when unit is no longer capable of providing GFCI protection

G. Designed to trip at maximum 6mA leakage current to ground.

H. Suitable for feed through protection.

I. Design Make: Hubbell GFR5362TR Series (Specification Grade)

2.5 SPECIAL RECEPTACLES

A. Terminals identified in accordance with UL 498 (X, Y, Z, white, green)

B. H and cord clamp housing material: Black Nylon.

C. Terminal material: Clear Polycarbonate.

D. Contact spring material: Brass.

E. Dielectric Voltage withstands 2,000V minimum

F. Include NEMA type as called for on drawings to match equipment. At a minimum the manufacturer shall have special purpose receptacles available to meet the following NEMA connection types:

1. 125 volt, 20 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L5-20R

2. 125 volt, 30 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L5-30R

3. 250 volt, 20 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L6-20R.

4. 250 volt, 50 ampere, 2 pole, 3 wire, grounding, Twist lock, NEMA L6-50R.

5. 250 volt, 50 ampere, 2 pole, 3 wire, grounding, Straight, NEMA 6-50R.

6. 250 volt, 20 ampere, 2 pole, 3 wire, grounding, NEMA 6-20R

7. 250 volt, 30 ampere, 2 pole, 3 wire, grounding, NEMA 6-30R

8. 125/250 volt, 50 ampere, 3 pole, 3 wire, grounding, NEMA 10-50R

9. 125/250 volt, 30 ampere, 4 pole, 4 wire, grounding, NEMA L14-30R (Dryer Receptacle). Plug configuration to match equipment furnished by equipment supplier.

10. 125/250 volt, 50 ampere, 4 pole, 4 wire, grounding, NEMA L14-50R (Range Receptacle). Plug configuration to match equipment furnished by equipment supplier

G. Design Make: Hubbell

H. Acceptable Manufacturers: Pass & Seymour, Leviton

2.6 SWITCHES

A. 120-277 VAC, 20 ampere rated.

B. Side or back wired.

C. Quiet operation.

D. Single pole, three way, and four way as called for on the plans.

E. Design Make:

1. Single pole: Hubbell catalog no. 1221

2. Three way: Hubbell catalog no. 1223

3. Four way: Hubbell catalog no. 1224

2.7 KEY SWITCHES

A. 120-277 VAC, 20 ampere rated.

B. Locking type. Provide (1) key per switch, all keyed alike.

C. Side or back wired.

D. Quiet operation.

E. Single pole, three way, and four way as called for on the plans.

F. Design Make:

1. Single pole: Hubbell catalog no. 1221L

2. Three way: Hubbell catalog no. 1223L

3. Four way: Hubbell catalog no. 1224L

2.8 MOMENTARY SWITCHES

A. 120-277 VAC, 20 ampere rated.

B. Momentary contact.

C. 2 circuit, 3 position, “center off”.

D. Side wired.

E. Quiet operation.

F. Design Make: Hubbell catalog no. 1557

2.9 BOILER SHUTDOWN SWITCHES

A. Surface mounted push-button maintained contact (N.C.)

B. ANSI 61 gray die-cast zinc enclosure

C. Provide label “To Stop Boilers”

D. Each label has white lettering on a red background

E. Design Make: Eaton 10250T5B62-S106

F. Acceptable Manufacturers:

1. ASCO

2. Square D

3. General Electric

2.10 ELECTRIC HAND DRYERS

A. 4” Deep ADA Complaint

B. 120 volt, 12.5 amps, 60 Hz, single phase electric hand dryer with 430mph air speed output. Brushless motor.

C. Automatic infrared optical sensor operated.

D. 79 dB sound power output.

E. Surface mount stainless steel or nickel housing.

F. 5-year warranty.

G. Design Make: Dyson Airblade V

H. Approved Equal: World Dryer VERDEdri

2.11 COVERPLATES

A. Provide impact nylon with white finish coverplates for general purpose flush devices.

B. Provide utility cover plates for surface mounted devices in mechanical rooms.

C. Provide gasketed weatherproof cover plates with a hinged cover on a cast aluminum outlet box for all devices in wet areas designated “WP”.

D. Provide high impact red cover plates for emergency circuits.

2.12 WEATHERPROOF COVERS

A. Impact resistant polycarbonate, NEMA 3R construction.

B. Clear cover to view the connection of the device.

C. UL listed as a weatherproof enclosure with the receptacle in use.

D. Hinged, latching cover with an opening at the bottom for a cord to exit the device.

E. Padlockable

F. Suitable for installation of a GFI protected duplex receptacle.

G. Design Make: Hubbell Catalog No. WP26MP

H. Acceptable Manufacturers:

1. Hubbell

2. Leviton

3. Arrow Hart

4. Pass & Seymour

5. Bryant

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Install devices generally where called for.

B. Coordinate exact locations of all devices with equipment, millwork, counters, fin radiation, windows, etc. and adjust locations as required as part of this contract.

C. Provide steel box for all devices.

D. Install receptacles and switches vertical, with the grounding pin down, and the toggle up in the on position.

E. Install all switches on the strike side of the door, with the edge of the outlet box approximately 3" from the door frame.

F. Do not install devices "back to back" in the same stud cavity without prior approval of the Owner. Offset devices as required to maintain code required fire rated assemblies or provide fire-stopping assembly around adjacent devices.

G. Provide plaster rings on all outlet boxes to permit flush installation of devices.

H. In all wet or damp areas, provide a surface mounted cast aluminum outlet box with threaded connections, gasketed cover, and non-ferrous screws.

I. Prior to installation and as part of the contract, relocate any device a distance of 5 feet in any direction at the request of the Owner.

J. Size outlet boxes in accordance with the NEC, based on the number and size of wires in the box.

K. Provide a coverplate on all devices.

3.2 EQUIPMENT MOUNTING HEIGHTS:

A. Refer to Specification Section 260100 – Basic Materials and Methods for mounting heights.

3.3 HAND DRYERS

A. Provide fastener types and blocking as required for existing tile-covered walls.

3.4 LABELING

A. Provide tape labels indicating panelboard and circuit on the outside of all device coverplates.

3.5 TESTING

A. Test all receptacles for proper voltage, polarity, and grounding.

B. Test all GFI receptacles for proper voltage, polarity, grounding, and verify the receptacle trips at 6 milliamperes or less.

C. Rewire receptacles as required until receptacles test properly.

END OF SECTION 260620

SECTION 260923 – WIRED LIGHTING CONTROLS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete installation, including luminaires, standards, hangers, supports, fittings, lamps, wiring, connections and controls, as indicated in the Contract Documents. Types of luminaires in this project include LED.

B. Provide startup of all lighting control systems by a factory certified manufacturer's representative in order to maintain all warranties. The contractor shall complete all startup request forms and complete all pre-startup installations a minimum of 2-weeks in advance or as otherwise required by the manufacturer. Provide initial system settings and owner training.

C. Provide Lighting System Functional Testing as described in this section by a factory authorized manufacturer's representative hereby referred to as the Testing Agent.

D. Refer to the General and Supplementary Conditions, Division 1 Specifications Sections for proposed phasing of this project. Provide manufacturer certified startup of all lighting control systems and Lighting System Functional Testing in each phased project area as required to turn each area over independently. The appropriate number of site visits to accomplish this phased scope of work shall be included in the base bid.

E. Refer to Specification Section 019113 for commissioning requirements related to this project.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Room Controllers
2. Power Packs
3. Low-Voltage Switches
4. Occupancy Sensors
5. Dimmer Switches
6. Timer Switches
7. Photo Sensors
8. System Functional Testing

1.3 SUBMITTALS

A. Submit shop drawings as described in Section 260010. Shop drawings shall include photometric data for each luminaire utilizing the specified lens/louver type, lamp(s) and ballast(s). All luminaire types and lighting control system components shall be submitted in a single complete brochure which shall be in the form of a soft cover binder with each luminaire separated by an identified index tab.

1. Room Controllers, Power Packs and Wiring Diagrams

2. Low Voltage Switches

3. Occupancy Sensors

4. Dimmer Switches

5. Timer Switches

6. Photo Sensors

a. Include data that indicates where the sensor shall be installed.

B. Submit for approval information detailing startup of the lighting control systems and the individual(s) who will be performing this service. Include documentation from the lighting control systems manufacturer indicating that they certify said individual(s) to perform this work. Submittal will be rejected if this information is not included.

C. Submit for approval a testing plan for all lighting control systems. Testing plan shall, at a minimum, observe and record all items described in the “Lighting System Functional Testing” part of this section and the individual(s) who will be performing this service. Include documentation from the lighting control systems manufacturer indicating that they authorize said individual(s) to perform this work. Submittal will be rejected if this information is not included.

1. Lighting System Functional Testing

a. Submittal of Functional Testing company name

b. Light meter to be used

c. Functional Testing Report after final adjustments are made

D. Warranty Information

1.4 QUALITY ASSURANCE

A. Lighting controls shall be standard products of manufacturers regularly engaged in the manufacture of the specific type of controls specified and shall be the manufacturer's latest standard design that complies with specification requirements. Firms installing the lighting controls shall have a minimum of five (5) years of successful installation experience on projects with interior lighting and controls work similar to the requirements of this project.

B. Codes and Standards

1. NEC:

a. Shall comply with Articles 220, 410 and 510 as applicable to installation and construction.

2. NEMA:

a. Shall comply with Standard Publication Nos. LE 1 and LE 2 as applicable to lighting equipment.

3. UL:

a. All interior lighting components shall be UL listed and labeled.

b. Comply with all applicable UL standards including UL 486A and B.

4. All work shall comply with applicable local code requirements of the authority having jurisdiction.

1.5 SEQUENCE OF OPERATION

A. Configure set-points and provide necessary programming to the local Room Controller(s). power packs or stand-alone line voltage or low-voltage controls devices to operate as listed below.

B. Initially Unoccupied Room with Multiple Luminaires:

1. Turn on manual switch for each lighting zone (single, multi-level, daylight) to initially turn on luminaires (Per NYS Energy Conservation Code) or automatically turn on luminaires to not more than 50% power.

2. Within a daylight zone, lighting output dims up/down via output from a photocell(s) to adjust and maintain a 40-footcandle minimum light level in the daylight zone.

3. Occupancy sensor utilizes infrared or dual technology (infrared/ultrasonic or infrared/acoustic) to detect occupants and keep luminaires on at 100% output level.

4. Upon occupants leaving room, occupancy sensor keeps luminaires on for a set time delay (20-minutes). If no occupants are detected over the course of the time delay, occupancy sensor turns all luminaires off.

5. Upon occupants re-entering the room, light switch shall be manually used to turn the luminaires back on or automatically turn on luminaires to not more than 50% power.

6. Sequence then repeats.

C. Initially Unoccupied Corridor, Restroom, or Stairwell:

1. Key switch per. plans for each lighting zone (single, multi-level, daylight) to initially turn on luminaires (Per Energy Conservation Code of New York State).

2. Occupancy sensor utilizes passive infrared and ultrasonic or passive infrared and acoustic technology to detect occupants.

3. Upon occupants leaving the area, occupancy sensor keeps luminaires on for a set time delay (20-minutes). If no occupants are detected over the course of the time delay, the lights controlled by the sensor shall be turned off.

4. Upon occupancy sensor detection of occupants re-entering the area, luminaires output shall be automatically turned back up to 100%.

5. Sequence then repeats.

D. Exterior Lighting:

1. Luminaires shall automatically turn off when daylight is present and satisfies the lighting needs.

2. All other exterior lighting shall be controlled so that the total lighting is automatically reduced by not less than 30% by selectively switching off or dimming luminaires at one of the following times:

a. During any time where activity has not been detected for 15 minutes or more.

3. Luminaires serving outdoor parking areas having a rated input wattage of greater than 78W and a mounting height of 24ft or less above ground shall be controlled by automatically reducing the power of each luminaire by a minimum of 50% when no activity is detected in the area illuminated by the controlled luminaires for a time of no longer than 15 minutes. No more than 1500W of lighting power shall be controlled together.

2.0 PART 2 - PRODUCTS

2.1 ROOM CONTROLLERS

A. Modular, stand-alone one room lighting control system (0-10V dimming and switching) with control of multiple user presets and room occupancy and daylight sensing for daylight harvesting.

B. Concealed mounting, self-contained, multi-channel lighting controller designed to communicate with occupancy and photo sensor inputs without the use of external power packs.

C. Shall allow for on-site commissioning controls via an infrared handheld remote control.

D. Lighting loads: Refer to floor plans for quantity of lighting channels per room. Where any room exceeds three channels, provide multiple room controllers networked together for proper system operation.

E. Multiple room controllers connected together in a local network must automatically arbitrate with each other, without requiring any configuration or setup, so the individual load numbers are sequentially assigned using each controller's device ID's from highest to lowest.

F. Each load shall at minimum be configurable to operate in the following sequences based on occupancy:

1. Auto-on/Auto-off

2. Manual-on/Auto-off

G. Manual override and LED indicated for each load.

H. Compatible with 120/277 VAC systems.

I. Maximum 20A combined 20A combined load per Room Controller.

J. All digital parameter data programmed into each room controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

K. Room controller shall include:

1. Real time current monitoring

2. Efficient 250 mA switching power supply

3. RJ-45 network ports with integral strain relief and dust covers

4. One dimming output per relay

a. The 0-10-volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting.

b. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected driver. The LED level indicators on connected dimmer switches shall utilize this new maximum and minimum trim.

c. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0—100% dimming range defined by the minimum and maximum calibration trim.

d. Calibration and trim levels must be set per output channel.

e. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

5. Fade rates for dimming loads shall be specific to connected switch buttons, and the load shall maintain a default value for any connected buttons that do not specify a unique value.

L. Class 2 dimming control signal: 0-10VDC, sinks up to 100mA per channel for control of compatible drivers.

M. UL 2043 Plenum rated.

N. IR window built-in to room controller for commissioning with remote control.

O. Provide (1) infrared remote control for startup, programming, and commissioning.

P. Provide with digital input/output interface that includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC.

Q. Five year warranty.

R. Design Make: Wattstopper LMRC-210 Series with LMIO-101 Digital I/O Interface

S. Approved Equivalents:

1. Crestron ZUM Series

2. Current NX Lighting Controls FX Series

3. Acuity nLight RPP20 series

4. Leviton IRC Series

2.2 LOW-VOLTAGE SWITCHES FOR ROOM CONTROLLERS:

A. Low-Voltage Switch

1. On/Raise & Off/Lower dimming control button with led status indicator

2. Dimming switch with seven bi-level LED’s to indicate load levels using 14 steps.

3. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

4. All digital parameter data programmed into each wall switch shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

5. Two RJ-45 ports for connection to the Room Controller network and other devices.

6. Multiple digital wall switches may be installed in a room by simply connecting the to the room controller network. No additional configuration shall be required to achieve multi-level switching.

7. Ramp rate may be adjusted for each dimmer switch.

8. Color by Architect.

9. Five year warranty.

10. Shall be of the same manufacturer as the room controller.

11. Design Make: Wattstopper LMDM-101 Series

12. Acceptable Manufacturer's:

    a. Crestron

    b. Current NX

    c. nLight

    d. Leviton

2.3 OCCUPANCY SENSORS

A. General:

1. All occupancy sensor layouts have been done using the "design make" sensors. The contractor shall be responsible for providing additional sensors and all associated equipment required to provide coverage for required areas.

B. Wall Mounted Sensors

1. Switchbox type (single circuit):

    a. 120-277 volt, 1000/1200 watts

    b. 1000 sq. ft. of coverage major motion, 300 sq. ft. of coverage minor motion, 180 degree viewing angle.

    c. Passive infrared technology.

    d. Adjustable time delay from 5 minutes to 30 minutes.

    e. Adjustable sensitivity from 20% to 100%.

    f. Manual on switch operation (vacancy mode).

    g. Internal photocell.

    h. Decorator style, ivory color.

i. Install in single gang switch box.

j. Design Make: Wattstopper WS-301 series.

k. Acceptable Manufacturers:

1) Crestron Steinel

2) Current NX Controls

3) nLight Controls

4) Leviton

2. Switchbox Dimming Type (single circuit):

a. 120-277 volt, 1000/1200 watts

b. 900 sq. ft. of coverage, 180 degree viewing angle, passive infrared technology.

c. Adjustable time delay from 30 seconds to 30 minutes.

d. Adjustable sensitivity from 20% to 100%.

e. Manual on switch operation (vacancy mode).

f. Decorator style, white color.

g. Install in single gang switch box.

h. Internal photocell.

i. Design Make: Wattstopper DW-311 series

j. Acceptable Manufacturers:

1) Crestron Steinel

2) Current NX

3) nLight

4) Leviton

3. Switchbox type (two circuit):

a. 120-277 volt, 800/1200 watts

b. 600 sq. ft. of coverage, 180 degree viewing angle.

c. Passive infrared technology.

d. Adjustable time delay from 30 seconds to 30 minutes.

e. Adjustable sensitivity from 20% to 100%.

f. Two manual on switches for independent control of two separate circuits.

g. Decorator style, ivory color.

h. Install in single gang switch box.

i. Design Make: Wattstopper PW-302 Series

j. Acceptable Manufacturers:

1) Crestron Steinel

2) Current NX

3) nLight

4) Leviton

C. Ceiling Mounted Sensors

1. Type OS-A Ceiling Mounted Sensors

a. Minimum 450 square feet of coverage, 360 degree viewing angle.

b. Passive infrared technology. Adjustable sensitivity.

c. Adjustable time delay from 5 to 30 minutes.

d. Install semi-flush in single gang switch box above the ceiling.

e. Standalone Sensors:

1) Includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC

2) Provide with relay power packs compatible with manual on operation and day-light operation and multi-level switching as shown on drawings.

3) Compatible with optional low voltage switch for manual-on operation.

4) Design Make: Wattstopper CI-300

5) Approved Equivalents:

a) Crestron Steinel

b) Current NX

c) Sensor Switch

d) Leviton

f. Sensors connected to Room Controllers:

1) Two RJ-45 ports for connection to the Room Controller and other devices.

2) Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

3) Load parameters including automatic/manual-on, blink warning, and daylight enable/disable when photo sensors are also connected to the Room Controller.

4) Shall be of the same manufacturer as the Room Controller

5) Design Make: Wattstopper LMPC-100 Series

6) Acceptable Manufacturers:

a) Crestron Zum

b) Current NX

c) nLight

d) Leviton

2. Type OS-B Ceiling Mounted Sensors

a. Minimum 1,000 square feet of coverage, 360 degree viewing angle.

b. Dual technology (Ultrasonic/PIR or Microphonic/PIR). Field selectable for either setting or both. Adjustable sensitivity.

c. Adjustable time delay from 5 to 30 minutes.

d. Installs surface mounted in 4” octagon J-box above the ceiling.

e. Standalone Sensors:

1) Includes an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC

2) Provide with relay power packs compatible with manual on operation and day-light operation and multi-level switching as shown on drawings.

3) Compatible with optional low voltage switch for manual-on operation.

4) Design Make: Wattstopper DT-300

5) Approved Equivalents:

a) Crestron Steinel

b) Current NX

c) Sensor Switch

d) Leviton

f. Sensors connected to Room Controllers:

1) Two RJ-45 ports for connection to the Room Controller and other devices.

2) Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

3) Load parameters including automatic/manual-on, blink warning, and daylight enable/disable when photo sensors are also connected to the Room Controller.

4) Shall be of the same manufacturer as the Room Controller

5) Design Make: Wattstopper LMDC-100 Series

6) Acceptable Manufacturers:

a) Crestron Zum

b) Current NX

c) nLight

d) Leviton

3. Type OS-C Ceiling Mounted Sensors

a. Nominal 10’ X 75’ of coverage for corridors.

b. Ultrasonic technology.

c. Adjustable time delay from 30 seconds to 15 minutes.

d. Adjustable sensitivity.

e. Manual sensor bypass.

f. Install surface mounted in single gang switch box above the ceiling.

g. Provide with relay power pack.

h. Design make: Wattstopper UT-300 series

i. Acceptable Manufacturers:

1) Crestron Steinel

2) Current NX

3) Sensor Switch

4) Leviton

2.4 LOW VOLTAGE TIMER SWITCH

A. Switch designed to fit decorator style switch plate covers.

B. Ivory color.

C. LCD countdown display

D. Pushbutton scroll adjustable solid-state time setting up to 12 hour

1. 5-minute increments up to 1 hour, 15 minute increments up to 12 hours.

E. Integral on/off push button

F. Amperage Capacity: 12mA DC / 41maA AC

G. Power Specification: 24 Volt AC/VDC/VAC rectified.

H. Approvals: UL, CSA

I. Design Make: Watt Stopper TS-400-24 Digital Time Switch or Approved Equal

J. Approved Equivalents:

1. Tork SS410

2.5 LINE VOLTAGE TIMER SWITCH

A. Switch designed to fit decorator style switch plate covers.

B. Ivory color.

C. LCD countdown display

D. Push button scroll adjustable solid state time setting up to 12 hour

E. Integral on/off push button

F. Amperage Capacity: 800W at 120VAC, 1,200W at 277VAC

G. Power Specification: 120-277 Volt AC, 50/60 Hz

H. Approvals: UL, CSA

I. Design Make: Watt Stopper TS-400 Digital Time Switch or Approved Equal

J. Approved Equivalents:

1. Current NX
2. Leviton
3. Acuity

2.6 DIMMER SWITCHES

A. 120V – 277V Line Voltage 3-Wire Dimmers:

1. Refer to drawings for 1-way or 3-way dimmers, provide applicable model.
2. Mechanical air-gap switch to disconnect load power
3. Vertical linear slider for dimming
4. Intended for 0–10V dimming for fluorescent and LED luminaires
5. Rated for 8 amps at 120 volts or 6 amps at 277 volts.
6. Contractor to verify dimmer is manufacturer certified with the dimmable fluorescent ballast.
7. Design Make: Lutron Diva DVF-103P Series or Approved Equal

B. 120V Line Voltage Dimmers for Lamps:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model.
2. Mechanical air-gap switch to disconnect load power
3. Vertical linear slider for dimming
4. Intended for 120V, 60Hz dimmer for LED, Halogen, Fluorescent. and Incandescent dimmable lamps.
5. Rated for 150W LED

6. Rated for 600W Incandescent/Halogen

7. Forward phase shift

8. Includes low-end trim adjustment slide

9. Design Make: Lutron DVCL Series or Approved Equal

C. 120V Line Voltage Dimmers for LED luminaires run off a driver:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model.

2. Mechanical air-gap switch to disconnect load power

3. Vertical linear slider for dimming.

4. Intended for 120V, 60Hz dimmer for ELV, LED, CFL, halogen and incandescent dimmable lamps.

5. Rated for 500W LED, 250W CFL

6. Reverse phase shift

7. Design Make: Lutron DVRP Series or Approved Equal

D. Magnetic Low-Voltage Dimmers:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model.

2. Mechanical air-gap switch to disconnect load power

3. Vertical linear slider for dimming

4. Dimmers shall not cause a magnetic low voltage transformer to operate above the transformers rated operating current or temperature.

5. Rated for 450W

6. Design Make: Lutron DVLV Series or Approved Equal

E. 0-10VDC Dimmers:

1. Provide 1-way or 3-way dimmers as shown on drawings, provide applicable model with matching wallplate.

2. Provide accessory 120-277V input power pack to power accessory sensors as indicated and 10V control power for dimming switch

3. Vertical linear slider for dimming

4. Intended for 0–10V dimming for fluorescent and LED luminaires

5. Controls 120–277V without a power pack, 8 Amp 120-277V rated. Internal power supply generates 0-10V output.

6. Provides 3-way preset switching functionality

7. Design Make: Lutron Diva 0-10V DVTV Series w/ Lutron PP-DV Powerpack

F. Approved Equivalents:

1. Sensor Switch

2. Hunt Dimming

3. Leviton

2.7 PHOTO SENSOR

A. Digital daylighting sensor shall work with the Room Controllers describe in this section to provide automatic dimming daylight harvesting capabilities.

B. Continuously monitors daylight entering window or skylight to enable daylight harvesting applications to provide control of room lighting based on presence of daylight.

C. Shall provide the option, when daylight contribution is sufficient, of turning the lights off or dimming the lights to a field-selectable minimum level.

D. Shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.

E. Shall provide adjustable cut-off time. Cut –off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.

F. Wall switch override shall allow occupants to control lighting level with dimming wall switches.

G. Automatically establishes application specific set points following manual calibration using a wireless configuration tool or PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF set points for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

H. Install in location recommended by the manufacturer.

I. Field of View: 60 Degree cone.

J. Sensitivity: 1-6,553 foot-candles (10-70,536 lux).

K. LED status and configuration indicators.

L. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool.

M. One RJ-45 port.

N. Connects to room controller via Cat.5e patch cable without the need for external power packs.

O. Five year warranty.

P. Shall be of the same manufacturer as the room controller.

Q. Design Make: Wattstopper LMLS-500 Series

R. Acceptable Manufacturers:

1. Crestron

2. Hubbell

3. Douglass Controls

2.8 TIME SWITCHES (CLOCKS)

A. Astronomical time switch.

B. Time switch controls for exterior lighting shall comply with the following:

1. They shall have a clock capable of being programmed for not fewer than 7 days.

2. They shall be capable of being set of seven different day types per week.

3. They shall incorporate an automatic holiday setback feature.

4. They shall have program backup capabilities that prevent the loss of program and time setting for a period of not less than 10 hours in event that power is interrupted.

C. Input voltage shall be 120/277v.

D. Shall have (2) sets of contacts rated for 30A each.

E. Program backup capabilities to prevent loss of program for a period of not less than 10 hours when power is interrupted.

F. NEMA 3R Enclosure if mounted outdoors.

G. Design Make: Tork-NSI DZS series.

H. Acceptable Manufacturers:

1. Tork-NSI

2. Intermatic

2.9 LOW-VOLTAGE WIRING FOR LIGHTING CONTROLS

A. 0-10VDC Wiring

1. UL Type CMP plenum rated cable

2. 0-10VDC wiring shall be white outer jacket with 2-conductor purple and gray jacket insulation on the internal 18AWG solid copper conductors.

3. Design Make: Liberty AV Solutions 18-2C-LVBP-WHT or Approved Equal

B. Unshielded Twisted Pair (UTP) Wiring

1. UL Type CMP plenum rated cable

2. RJ-45 factory terminated RJ-45 connectors

3. ANSI/TIA-568-C.1 certified Cat. 6 Cable

4. Max. length 100-meters

5. Design Make: Belden, West Penn Wire, Hubbell, Leviton

3.0 PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions, under which luminaires are to be installed, and substrate for supporting luminaires. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation meeting after receipt of approved submittals to review the following:

1. Confirm the location and mounting of all digital lighting control devices, with special attention to placement of occupancy and photo sensors.

2. Review the requirements for low-voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

3.3 COORDINATION

A. Refer to respective reflected ceiling plan for each area. Reflected ceiling plans indicate proper luminaire location only. Locate occupancy sensors and photo sensors per the manufacturer’s recommendations. Coordinate the proper arrangement with all other ceiling mounted items. Contract Documents indicate luminaire characteristics (type), quality, quantity, etc. Verify with the ceiling supplier design of actual ceiling installed in each area and coordinate compatible luminaire flange/trim type.

B. General

1. Install interior lighting controls at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's 'Standard of Installation", NEMA standards, and with recognized industry practices.

2. Make installation such that the lighting controls are free of finger marks, flaws, scratches, dents or other imperfections.

3.4 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and equipment shall be delivered with UL and manufacturer's labels intact and legible in factory fabricated containers.

B. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

C. Handle interior lighting luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged luminaires or components; replace with new.

3.5 SEQUENCING AND SCHEDULING

A. Coordinate with other work including ceiling type, wires/cables, electrical boxes, fittings, and raceways, to properly interface installation of interior luminaires with other trades.

B. The contractor shall provide the lighting control systems manufacturer with three weeks written notice of the system startup and adjustment date.

3.6 OCCUPANCY SENSORS

A. Provide all necessary mounting brackets, wiring, low voltage transformers and control relays required to provide control of areas indicated.

B. Provide initial time delay and sensitivity settings per owner’s representative.

C. Install in location as recommended by the manufacturer.

D. Refer to “Lighting System Functional Testing” part of this section for additional information.

3.7 PHOTO SENSORS

A. For calibration of photosensor, contractor shall use handheld digital light meter measuring device in the 0-200 foot-candle range. Provide adjustments to threshold on sensor to meet user requirements. Initial foot-candle threshold setting to automatically turn off lights shall be 50 foot-candles. Provide adjustments to meet owner requirements and space constraints.

B. Install in location as recommended by the manufacturer.

C. Refer to "Lighting System Functional Testing" part of this section for additional information.

3.8 CONTROL WIRING

A. Provide all required low-voltage control wiring for lighting control system components.

B. Provide RJ-45 factory terminated Cat. 6 or better Unshielded Twisted Pair (UTP) cable with RJ-45 connectors to connect switching, photo control, and occupancy sensing devices on the Room Controller network. Cables shall manufacturer approved for the connectivity solution.

C. Provide 0-10VDC wiring for dimming from Room Controller and dimming switches to the drivers.

D. Control Wiring Installation:

1. All interior cabling shall be installed concealed inside the wall cavities and ceiling space.

2. Provide a continuous raceway system in accordance with NEC Article 800 for horizontal cable runs through all inaccessible ceiling (including drywall) and wall cavity spaces. All flexible raceway system runs shall be securely attached to ceiling joists and wall studs 3-feet O.C and removal and addition of cables in the future.

3. UTP Cables shall be supported by Cable Hangers 3-foot on center. When installed in cable tray zip-tie to cable tray away from STP, coaxial cables, and optical fiber cables. Provide additional stacked Cable Hangers when filled greater than 50%.

3.9 LIGHTING SYSTEM FUNCTIONAL TESTING

A. Lighting system functional testing shall comply with the following requirements:

1. Provide plan markup which indicates the exact location of each sensor, direction of aim, and certify on the plan that the direction of aim and placement are in compliance with manufacturer's requirements. Include this plan with the Operation & Maintenance Manuals.

2. Occupancy Sensor Controls:

   a. Certify that the occupancy sensor has been located and aimed in accordance with the manufacturer's recommendations.

   b. All devices shall be tested. Verify the following:

      1) Where occupant sensor controls include status indicators, verify correct operation.

      2) The controlled lights turn off or down to the permitted level within the specified time.

      3) The lights turn on only when manually activated.

      4) The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.

3. For Time – Switch Controls:

   a. Verify that timers are properly programmed with weekday, weekend and holiday schedules.

   b. Provide documentation to the Owner of time-switch controls programming including weekday, weekend, and holiday schedules and set-up and preference program settings. Include a copy in testing documentation package for approval by the Engineer.

   c. Verify time of day and day of week are properly set.

   d. Verify that any battery back-up is installed and energized.

   e. Verify that any override timer is set for less than 2 hours.

   f. Simulate occupied condition and verify the following:

      1) All lights can be turned on or off by respective area control switch.

      2) Light switches control only those lights in the enclosed area where the switch is located.

   g. Simulate unoccupied condition and verify the following:

      1) Non-exempt lights turn off.

      2) Manual override switches allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.

h. For Daylight Responsive Controls:

1) Verify that the control sensing devices have been properly located, field calibrated and set for accurate control set points and threshold lighting levels.

2) Daylight controlled lighting loads adjust to light levels set points in response to available daylight.

3) The location of calibration adjustment equipment is readily accessible only to authorized personnel.

4) Record all set points and verify with calibrated light meter the actual field recorded lighting control levels.

5) Upon request, repeat measurements in the presence of the Design Professional or their authorized representative to validate lighting level control response.

4. Create a log of deficiencies noted during testing. Correct all deficiencies prior to project Commissioning Activity. Refer to Section 019113.

5. Provide records of all lighting system functional testing to the Commissioning Agent on the test form(s) provided within this section PRIOR to scheduled project functional testing.

6. Correct any deficiencies and discrepancies noted by the Commissioning Agent during their functional testing.

7. The Commissioning Agent will incorporate all final testing results into the project Commissioning Record.

B. Test Form:

1. Instruction: Contractor to complete either the following form or the form contained in the approved testing plan for each room in the project that receives lighting controls. Include completed forms in the Operation and Maintenance Manuals. Provide electronic copy of all completed testing forms and reports to the Commissioning Authority for their use.

Room Name/Number:	***Date:***	
Testing Agent's Name:		
Testing Agent's Signature:		
Testing Agent's Company & Position:		
Occupancy Sensor Controls	*Initials*	*N/A*
Verify that the occupancy sensor has been located and aimed in accordance with the manufacturer's recommendations such that occupants within the space properly trigger lighting operation without false trigger from adjacent areas.		
Verify that the status indicators on the occupancy sensor are operating correctly.		
Verify that the controlled lights turn OFF or down to the permitted level within the specified time.		
Verify that the controlled lights turn ON only when manually activated.		
Verify that the lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.		
Record sensitivity level and delay settings for occupancy sensor control:		
Time - Switch Controls	*Initials*	*N/A*
Verify that the timers are properly programmed with weekday, weekend, and holiday schedules.		
Record time schedule as programmed:		
Verify that the time of day and day of week are properly set.		
Verify that battery back-up is installed and energized.		
Verify that the override timer is set for less than 2 hours.		
Simulate occupied condition: I verify that all lights can be turned on or off by respective area control switch.		
Simulate occupied condition: I verify that the lighting switches control only those lights in the enclosed area where the switch is located.		
Simulate unoccupied condition: I verify that all non-exempt lights turn off.		
Simulate unoccupied condition: I verify that the manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.		
Daylight Responsive Controls	*Initials*	*N/A*
Verify that the control sensing devices have been properly located, field calibrated, and set for accurate control set points and threshold lighting levels.		
Verify that the daylight controlled lighting loads adjust to light levels set points in response to available daylight.		
Verify that the location of calibration adjustment equipment is readily accessible only to authorized personnel.		

Record set point (foot-candles):	
Record lighting control level with calibrated light meter (foot-candles):	
Record cut-off time (minutes):	
Record fade rate (units/second):	

3.10 TRAINING

A. Upon completion of the system startup, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the lighting control system. Include sign in sheet with Operation & Maintenance Manuals.

3.11 WARRANTY

A. All lighting controls equipment included in this section shall be fully tested and guaranteed for a period of five years after Owner's Representative written acceptance.

END OF SECTION 260923

SECTION 262213 - LOW VOLTAGE DISTRIBUTION TRANSFORMERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 DESCRIPTION OF WORK

A. This section includes minimum requirements for the following:

1. Dry Type Transformers.

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)

a. 240 - Overcurrent Protection

b. 450 - Transformers

2. The following National Electrical Manufacturers Association (NEMA) Standards:

a. NEMA ST 20-2014 – Dry Type Transformers

3. The Code of Federal Regulations 10:

a. CFR 431 – Distribution Transformer Efficiency

4. The following U.L. Standards:

a. UL1561 – Dry Type Transformers

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Dry Type Transformers

2.0 PART 2 - PRODUCTS

2.1 DRY TYPE TRANSFORMERS

A. Electrical specifications:

1. All insulating materials are to be rated for 220°C.

2. Transformers 15 kVA and larger shall be rated for 150°C temperature rise above 40°C ambient. Transformers under 15 kVA shall be rated for 115°C temperature rise above 40°C ambient.

3. Transformers 25 kVA and larger shall have (2) 2 ½% full capacity above normal tamps and (2) 2 ½% full capacity below normal taps.

4. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.

B. Construction:

1. Transformer coils shall be of the continuous aluminum wound construction and shall be impregnated with non-hygroscopic, thermosetting varnish.

2. All cores to be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500 kVA shall be clamped utilizing insulated bolts through the core laminations to provide proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.

3. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.

4. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The enclosure shall have a baked polyester powder coat suitable for use in damp locations. Color shall be ANSI 49 gray.

5. Transformers under 30 kVA shall be wall mounted. Transformers 30 kVA and larger shall be floor mounted.

C. Minimum Efficiency:

1. Transformers shall meet the requirements for minimum efficiency as outlined in the Code of Federal Regulations 10 CFR 431.

Single-phase		Three-phase	
kVA	Min. Efficiency	kVA	Min. Efficiency
15	97.7	15	97.89
25	98.0	30	98.23
37.5	98.2	45	98.40
50	98.3	75	98.60
75	98.5	112.5	98.74
100	98.6	150	98.83
167	98.7	225	98.94
250	98.8	300	99.02
333	98.9	500	99.14
		750	99.23
		1000	99.28

D. Sound Levels:

1. Sound levels shall be warranted by the manufacturer not to exceed NEMA ST 20-2014 standards.

E. Design Make: Square D

F. Acceptable manufacturers:

1. General Electric

2. Eaton

3. Siemens

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

3.2 DRY TYPE TRANSFORMERS

A. For floor mounted transformers over 45 kVA, provide a 4" housekeeping pad.

B. Bolt transformers to floor or pad utilizing vibration isolators.

C. Install transformers with sufficient Code required clearances.

D. Do not install transformers under or over panelboards per N.E.C.

E. All conduit connections to transformers shall be made with liquidtight flexible conduit. Provide green insulated grounding conductor.

F. Meggar transformer prior to energizing.

END OF SECTION 262213

SECTION 262400 - SWITCHBOARDS AND PANELBOARDS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. Circuit Breakers
2. Branch Circuit Panelboards
3. Distribution Panelboards
4. Enclosed Circuit Breakers

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)
    a. 240 - Overcurrent Protection
    b. 368 - Busways
    c. 404 - Switches
    d. 408 - Switchboards and Panelboards
2. The following National Electrical Manufacturers Association (NEMA) Standards:
    a. NEMA AB 1 1993 - Molded Case Circuit Breakers and Molded Case Switches
    b. NEMA BU 1 - Busways

c. NEMA PB 1 - Panelboards

d. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.

e. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

f. NEMA 250 - Enclosures for Electrical Equipment

3. The following American National Standards Institute (ANSI) standards:

a. ANSI/NETA-2013 ATS for Electrical Power Equipment and Systems

b. ANSI C37 – Low-Voltage Power Operated Circuit Breakers

c. ANSI/IEEE C12.1 Code for Electric Metering

4. The following U.L. Standards:

a. UL 50 - Enclosures for Electrical Equipment

b. UL 67 - Panelboards

c. UL 98 - Enclosed and Dead-Front Switches

d. UL 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures

e. UL 857 - Underwriters Busway Standard

f. UL 891 – Standard for Switchboards

g. UL 943 - Standard for Ground Fault Circuit Interrupters

h. UL 1066 - Low-Voltage Power Operated Circuit Breakers

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Thermal Magnetic Molded Case Circuit Breakers

2. Electronic Trip Molded Case Circuit Breakers

3. Electronic Trip Insulated Case Circuit Breakers

4. Branch Circuit Panelboards

5. Distribution Panelboards

6. Enclosed Circuit Breakers

1.5 MINOR MODIFICATIONS

A. Provide modifications to circuit breaker trip rating within the frame size at no additional cost, until shop drawings are reviewed and submitted.

1.6 FIELD SUPERVISION

A. Provide field supervision and start-up by a qualified representative of the equipment manufacturer. Provide certification that the equipment has been installed in accordance with the manufacturer's requirements.

2.0 PART 2 - PRODUCTS

2.1 CIRCUIT BREAKERS

A. General

1. UL 489 listed.

2. Below 250Amps – Unless otherwise noted, operation shall be from a fixed thermal magnetic trip unit. Permanent trip unit containing individual thermal and magnetic trip elements.

3. 250Amps and above - Include field adjustable electronic Long Time, Short Time, and Instantaneous trip unit.

4. 400Amps and above - Include field installed interchangeable rating plugs.

5. Provide an over-center, trip-free handle to provide quick-make, quick-break contact action.

6. Provide multi-pole breakers with common trip.

7. When the circuit breaker has tripped, the handle shall move to a position between the "on" and "off" positions. Provide a visual indication that the circuit breaker has tripped.

8. The ampere rating shall be clearly marked on the face of the circuit breaker.

9. Series rated fuse/circuit breaker installations are not acceptable.

10. Make provisions to add circuit breaker handle locks.

11. Circuit breakers shall have voltage, ampere, and interrupting ratings as called for on the Panelboard Schedule.

12. New circuit breakers installed in existing panelboards shall be UL listed for use in panelboard.

B. Thermal Magnetic Molded Case Branch Circuit Breakers

1. Molded case circuit breakers shall be constructed of a glass reinforced insulating material. All current carrying components shall be completely insulated and isolated from the outside of the circuit breaker.

2. 60°C terminal temperature rating for circuit breakers rated 125 amperes or below.

3. 75°C terminal temperature rating for circuit breakers rated above 125 amperes.

4. All 20 and 30 ampere, single pole circuit breakers shall be UL listed for switching duty.

5. Circuit breakers shall be bolt-on. Plug-on acceptable in load centers on residential applications only.

6. Circuit breakers rated 250 amperes and below shall be UL listed HACR type.

7. Where ground fault circuit breakers are required, provide a shunt trip circuit breaker with a zero sequence sensing ground fault module.

8. Design Make: Square D QOB (250 volt), EH, EHB (480 volt), I-Line style (600 volt).

9. Acceptable Manufacturers:

   a. Eaton

   b. ABB

   c. Siemens

C. Standard Function Electronic Trip Molded Case Circuit Breakers

1. Microprocessor based true RMS sensing current sensing device with accuracy to the thirteenth harmonic.

2. Sensor frame and rating plug size shall be as indicated on the Panelboard Schedule.

3. UL listed to carry 80% of the ampere rating continuously.

4. Provide the following time/current response adjustments:

   a. Long Time Pickup

   b. Long Time Delay

   c. Short Time Pickup

   d. Short Time Delay (I2t IN only)

e. Instantaneous Pickup

5. Provide a means to cover the trip unit adjustments in accordance with NEC Article 240-6(b).

6. Provide trip indication for overload, short circuit, and ground fault trips.

7. Tripping system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing.

8. Design Make: Square D LX, MX, NX, PX

9. Acceptable Manufacturers:

a. Eaton

b. ABB

c. Siemens

D. Arc Mitigation and Safety Options

1. Shall be provided on all circuit breakers 1200 Amps or larger.

2. Alternate Maintenance Setting Switch (AMS)

3. Designed for the temporary arc-flash incident energy reduction during maintenance activities.

4. For each feeder circuit breaker, provide a manual switch on the compartment door to switch the circuit breaker short-time tripping characteristics to instantaneous with minimum pick-up setting, in order to reduce the danger from potential arc-flash at downstream equipment.

5. Provide a lock feature for the AMS switch so that it may be locked in either the Off or On maintenance mode position.

6. Provide a blue LED indicating light to indicate AMS switch is in the maintenance mode.

7. Wire contacts on all AMS switches to a common alarm input to plant control system.

8. Provide for remote AMS switches or indication, as needed.

9. If circuit breaker integral trip unit cannot be controlled as specified, provide discrete relay with shunt-trip or equivalent to provide specified performance.

2.2 BRANCH CIRCUIT PANELBOARDS

A. 240 Volt rated, maximum 400 amperes.

B. Copper bus bars with high dielectric thermoplastic insulators.

C. Provide continuous current ratings, short circuit current ratings, branch circuit breakers, main circuit breaker or main lugs, and flush or surface trims as called for on the Panelboard schedule.

D. Provide nameplate on each panelboard indicating voltage, current, phase, wire, and short circuit rating.

E. 100% rated neutral of the same material as the main bus.

F. Provide ground bus of the same material as the main bus.

G. Interior trim shall be dead front construction, with pre-formed metal twist-outs covering unused mounting space.

H. Enclosures shall be nominal 20” wide by 6” deep, galvanized steel construction with removable endwalls and knockouts.

I. Fronts

1. Surface or flush mounted as called for on the Panelboard Schedule.

2. ANSI 49 gray electrodeposited enamel.

3. Fronts shall be one piece with door, and continuous hinge to the enclosure.

4. Provide cylindrical tumbler type lock with catch and spring loaded stainless steel door pull. All locks shall be keyed alike.

5. Provide a clear plastic directory card holder on the inside of the door.

J. Design Make: Square D NQ Series

K. Acceptable Equivalents:

1. Eaton Pow-R-Line Series

2. ABB ReliaGear Series

3. Siemens P1 Panelboard Series

2.3 480 VOLT BRANCH CIRCUIT PANELBOARDS

A. 480 Volt rated, maximum 400 ampere main circuit breaker or 600 ampere main lugs.

B. Copper bus bars with high dielectric thermoplastic insulators.

C. Provide continuous current ratings, short circuit current ratings, branch circuit breakers, main circuit breaker or main lugs, and flush or surface trims as called for on the Panelboard schedule.

D. Provide nameplate on each panelboard indicating voltage, current, phase, wire, and short circuit rating.

E. Provide ground bus of the same material as the main bus.

F. Interior trim shall be dead front construction, with pre-formed metal twist-outs covering unused mounting space.

G. Enclosures shall be nominal 20” wide by 6” deep, galvanized steel construction with removable endwalls and knockouts.

H. Fronts

1. Surface or flush mounted as called for on the Panelboard Schedule.

2. ANSI 49 gray electrodeposited enamel.

3. Fronts shall be one piece with door, and continuous hinge to the enclosure.

4. Provide cylindrical tumbler type lock with catch and spring loaded stainless steel door pull. All locks shall be keyed alike.

5. Provide a clear plastic directory card holder on the inside of the door.

I. Design Make: Square D “NF”

J. Acceptable Equivalents:

1. Eaton Pow-R-Line Series

2. ABB ReliaGear Series

3. Siemens P1 Panelboard Series

2.4 DISTRIBUTION PANELBOARDS

A. 600 Volt rated, maximum 1200 amperes.

B. Copper bus bars with high dielectric polyester insulators.

C. Provide continuous current ratings, short circuit current ratings, branch circuit breakers, main circuit breaker or main lugs, and flush or surface trims as called for on the Panelboard schedule.

D. Provide nameplate on each panelboard indicating voltage, current, phase, wire, and short circuit rating.

E. 100% rated neutral of the same material as the main bus.

F. Provide ground bus of the same material as the main bus.

G. Interior trim shall be dead front construction.

H. Enclosures shall be galvanized steel construction with removable endwalls and knockouts. If design make equipment is not used, verify enclosure will fit in space allotted.

I. Fronts

1. Surface mounted.

2. ANSI 49 gray electrodeposited enamel.

3. Fronts shall be one piece with door, and continuous hinge to the enclosure where possible.

4. Provide cylindrical tumbler type lock with three point latch. All locks shall be keyed alike.

5. Provide a clear plastic directory card holder on the inside of the door.

J. Design Make: Square D I-Line Series

K. Acceptable Equivalents:

1. Eaton Pow-R-Line Series

2. ABB ReliaGear next Power Panel Series

3. Siemens P4/P5 Series

2.5 ENCLOSED CIRCUIT BREAKERS

A. Circuit breakers shall be as specified above.

B. Ratings as indicated on plans and as required by the installation.

C. Short Circuit Withstand ratings of the assembly shall be equal to that of the circuit breaker.

D. Provide NEMA rated enclosure as called for on the drawings, and as required by the environment.

E. Externally operable handle, with provisions for padlocking in the OFF and On position.

F. Gray baked enamel finish except for stainless steel, NEMA 4X enclosures.

G. Knockouts at the top and bottom of NEMA 1 enclosures.

H. Design Make: Square D

I. Acceptable Manufacturers:

1. Eaton

2. ABB

3. Siemens

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner's Representative.

F. Provide testing in accordance with ANSI/NETA-2013 ATS for Electrical Power Equipment and Systems.

3.2 CIRCUIT BREAKERS

A. Install circuit breakers in panelboards and switchboards as called for on the plans and as recommended by the manufacturer.

B. Adjust circuit breaker pick-up level and time delay settings to the values called for on the drawings indicated in the coordination study designated by the Engineer.

3.3 BRANCH CIRCUIT AND DISTRIBUTION PANELBOARDS

A. Securely support all panelboard enclosures to walls. Install true and level.

B. Install panelboards with top of the highest circuit breaker handle at 6'-6" to the centerline.

C. Provide (5) five empty ¾" conduits and (1) one empty 1 ½" conduit from each flush mounted panelboard backbox to the accessible ceiling space. Make 90^{o} turn above the ceiling, arranged for further continuation of raceway, and cap.

D. Make all branch circuit and feeder connections.

E. Provide channel support between the wall and backbox for panelboards installed on outside walls.

F. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer's recommendations.

G. Measure steady state load currents on each panelboard feeder. Rearrange branch circuits in the panelboard to balance the load within 20% of each other. Maintain proper phasing.

H. Provide identification as required per section 260100.

3.4 ENCLOSED CIRCUIT BREAKERS

A. Install enclosed circuit breakers in locations shown on plans. Install true and level.

B. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer's recommendations.

C. Provide identification as required per section 260100.

END OF SECTION 262400

SECTION 262913 - SWITCHES, CONTACTORS AND MOTOR CONTROLLERS

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 DESCRIPTION OF WORK

A. This section includes minimum requirements for the following:

1. Disconnect Switches
2. Lighting Contactors
3. Motor Control Equipment
4. Low Voltage Fuses

1.3 QUALITY ASSURANCE

A. All low voltage power distribution equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials and installation practices specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Electric Code (NFPA 70)
    a. 240 - Overcurrent Protection
    b. 404 – Switches
    c. 430 – Motors, Motor Circuits, and Motor Controllers
2. The following National Electrical Manufacturers Association (NEMA) Standards:
    a. NEMA AB 1 1993 - Molded Case Circuit Breakers and Molded Case Switches
    b. NEMA PB 1.1 - Instructions for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or less.

c. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

d. NEMA 250 - Enclosures for Electrical Equipment

3. The following American National Standards Institute (ANSI) standards:

a. ANSI/IEEE C12.1 Code for Electric Metering

4. The following U.L. Standards:

a. UL 50 - Enclosures for Electrical Equipment

b. UL 98 - Enclosed and Dead-Front Switches

1.4 SUBMITTALS

A. Provide product data including voltage, current, interrupting rating, and enclosure type for the following:

1. Disconnect Switches

2. Lighting Contactors

3. Motor Control Equipment

4. Low Voltage Fuses

1.5 MINOR MODIFICATIONS

A. Provide modifications to fuse sizes within the frame size at no additional cost, until shop drawings are reviewed and submitted.

1.6 FIELD SUPERVISION

A. Provide field supervision and start-up by a qualified representative of the equipment manufacturer. Provide certification that the equipment has been installed in accordance with the manufacturer's requirements.

2.0 PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Three pole, single throw, or as called for on the drawings.

B. Quick-make, quick-break switch operating mechanism.

C. Mechanical service life (switching cycles) / typical: 10000

D. 600VAC rated, current rating as called for on the drawings.

E. Defeatable dual cover interlock external override mechanism to open the disconnect switch door without opening the disconnect switch.

F. All current carrying parts shall be plated to resist corrosion.

G. Lugs shall be removable and rated for 75°C temperature rating.

H. Switch blades shall be visible when the switch is in the open position and the door is open.

I. Switch shall be padlockable in the OFF and ON positions.

J. Provide fusible switches with rejection type fuse holders and fuses as indicated on the plans or as per fed equipment requirements.

K. Enclosure shall be steel with gray baked enamel paint.

L. Provide NEMA type enclosures as called for on the drawings. Provide NEMA Type 3R for all rooftop and exterior switches.

M. NEMA type 1 enclosures shall be equipped with knockouts.

N. Design Make: Square D

O. Acceptable Equivalents:

1. Eaton

2. Siemens

2.2 MOTOR CONTROL EQUIPMENT

A. General

1. Provide motor starters, disconnect switches, etc., as listed on the Electric Equipment and Control Schedule on the drawings.

2. Starters, contactors and controllers shall comply with NEMA standards having general purpose NEMA 1 or 1B enclosure unless otherwise called for. Provide explosion proof, weather resistant or watertight construction as required. Starters shall be minimum NEMA size 0 with overloads in each phase sized per NEC, nameplate motor full load amperage, service factor, and motor operating conditions.

3. Pad lock arrangements shall be provided to lock the disconnect device in the "off" position. Magnetic starters shall be provided with a control power transformer with 120V secondary and primary and secondary fusing and be sized to accept the loads imposed there on. Starters shall have transformer type pilot lights and 6 volt long life bulbs. Each starter subject to electrical interlock and/or automatic control shall have necessary auxiliary contacts.

4. Auxiliary devices: Provide pushbutton stations, pilot lights, devices, relays, transformers, selector switches, electric thermostats, auxiliary starter contacts as required for functions called for. Provide separate relay for each speed to operate electric dampers or other devices as required for multispeed motor circuit.

5. Manual Motor Starter: Provide all starters with thermal overload(s); and pilot light(s), and handle lock-out provisions. Gang starter with selector switch for multispeed applications. Provide single or 2-pole as required:

   a. 120 volt, single-pole, surface mounted: Square-D FG-1P.

   b. 120 volt, single-pole, flush mounted: Square-D FS-1P.

   c. 240 volt, two-pole, surface mounted: Square-D FG-2P.

   d. 240 volt, two-pole, flush mounted: Square-D FS-2P.

   e. 120 volt, single-pole, two speed, surface mounted: Square-D FG-11P.

   f. 120 volt, single-pole, two speed, flush mounted: Square-D FS-101P.

   g. 240 volt, two-pole, two-speed, surface mounted: Square-D FG-22P.

   h. 240 volt, two-pole, two-speed, flush mounted: Square-DFS-202P.

   i. 120 volt, single-pole, H-O-A selector, surface mounted: Square-D FG-72P.

   j. 120 volt, single-pole, H-O-A selector, flush mounted: Square-D FS-72P.

   k. 240 volt, two-pole, H-O-A selector, surface mounted: Square-D FG-72P.

   l. 240 volt, two-pole, H-O-A selector, flush mounted: Square-D FS-72P.

   m. 120 volt, single-pole, surface mounted, explosion proof: Square-D FR-1H.

   n. 240 volt, two-pole, surface mounted, explosion proof: Square-D FR-2H.

   o. Manual Motor Starter - Speed Controller: Shall be similar to "Manual Motor Starter", above, except two-gang with motor speed control sized to handle motor indicated, with positive full on and full off bypass of speed control unit.

6. Manual Starter with Relay: Shall be similar to "Manual Motor Starter", above, except two-gang with relay sized for load indicated, and hand-off-automatic switch. Connect relay for 120V operation on load side of starter in "automatic" mode. Coordinate connection of Form C maintained contact for control with Mechanical Contractor.

B. Magnetic Starters

1. Shall be single-speed, across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings.

2. Starters shall be mounted in NEMA 1 enclosures unless otherwise indicated.

3. Magnetic starters shall be equipped with double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring.

4. Starter shall have straight-through wiring. Coils shall be of molded construction and shall be replaceable from the front without removing starter.

5. Overload relays shall be melting alloy type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

6. Provide hand-off-auto selector switch**,** start-stop pushbuttons and "run" pilot light in cover. Wire for maintained contact unless otherwise noted.

C. Combination Magnetic Starter: Shall be similar to "Magnetic Starter", above, except shall include fusible disconnect switch connected ahead of starter. The disconnect handle shall be in control of the disconnect device with the door open or closed. Disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off".

D. Combination Two-Speed Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except with two starters, and six thermal overload units coordinated to match torque and horsepower characteristics of the motor. Starter shall be designed for variable torque operation, and shall be provided with high-low-off-auto selector switch and high and low pilot lights mounted in the cover. Wire for maintained contact unless otherwise noted.

E. Combination Reduced Voltage Magnetic Starter: Shall be similar to "Combination Magnetic Starter", above, except auto-transformer closed transition reduced voltage type with auto-transformer protection by winding over-temperature device.

F. Packaged Control Unit: Shall be furnished under Division 22 or 23, and connected by Electrical Contractor. Generally consists of one or more starters, disconnect switches and additional control devices prewired.

G. Contactor: Shall be similar to "Magnetic Starter", above, except without thermal overload units.

H. Duplex Motor Controller

1. General Operation

a. Controller consists of two starters in a common enclosure with separate fused disconnect switches for each starter.

b. An integral alternation circuit shall be provided which alternately operates first one motor and then the other on each successive closing of an external control device.

c. If one motor is running and its associated disconnect is opened, an overload relay trips or the starter is de-energized for any reason; the other motor will automatically be started.

2. Magnetic starters shall be single-speed; across-the-line type rated in accordance with NEMA standards, sizes and horsepower ratings.

3. Magnetic starters shall be mounted in NEMA 1 enclosures unless otherwise indicated.

4. Magnetic starters shall be equipped with double break silver alloy contacts; all contacts shall be replaceable without removing starter or disconnecting power wiring.

5. Overload relays shall be melting alloy type with replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

6. Provide hand-off-auto selector switch**,** start-stop pushbuttons and "run" pilot light in cover for each motor. Wire for maintained contact unless otherwise noted.

7. Provide one fused control circuit transformer.

8. Controller shall be prewired with a terminal block for connection of external control devices.

I. Design Make: Square D Class 8XXX

J. Acceptable manufacturers:

1. Square D

2. Eaton

3. Siemens

2.3 LIGHTING CONTACTORS

A. 480V rated contacts, minimum of 30A or larger rating as called for on the drawings.

B. Electrically operated, electrically held

C. Provide with 120V coil

D. Provide with NEMA 1 enclosure or enclosure type if specified otherwise on drawings.

E. Provide with number of poles as called for on the drawings

F. Shall be field convertible for NO/NC operation

G. Design Make: Square D Class 8903

H. Acceptable manufacturers:

1. Eaton

2. Siemens

2.4 LOW VOLTAGE FUSES

A. All fuses rated 600 volts and below shall be rejection type dual-element, time-delay type. Provide one complete sets of fuses for all fusible disconnect switches, plus 3 spare fuses of each size. Deliver spare fuses to the Owner and obtain receipt.

B. Acceptable manufacturers: Fuses 600 amperes and below: Bussman Type FRN-R (300 volts), Type FRS-R (600 volts) or Approved Equal.

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. Provide identification for all equipment and devices as indicated in section 260100.

B. Provide miscellaneous bolts, washers, nuts, clips, lockwashers, hardware, etc. as required to install equipment.

C. Unload, move, handle, set in place, install, erect, assemble, connect, test etc. all items ad required.

D. Provide minimum NEC working clearance for all equipment.

E. Verify cable/lug sizes for terminations. Where a feeder is sized larger the lug provide replacement lug or in line splice as directed by Owner’s Representative.

3.2 DISCONNECT SWITCHES

A. Install disconnect switches in locations shown on plans. Install true and level.

B. Tighten all bolt and lug connections using a torque wrench or screwdriver per the manufacturer’s recommendations.

C. Provide identification as required per Section 260100.

D. Provide fuses in all fusible switches.

E. All roof mounted disconnect switches shall be a minimum NEMA 3R rating.

F. Provide stainless steel hardware and uni-strut racking for all roof mounted disconnect switch supports. Do not install disconnect switches on roof curbs below the roof flashing level. Maintain roof warranty for all disconnect switch and associated raceway support installations.

G. Disconnect switches may be mounted to HVAC equipment where approved by the equipment manufacturer and not interfere with access panel or internal components.

3.3 LOW VOLTAGE FUSES

A. Install low voltage fuses in disconnect switches as called for on the plans.

B. Turn all spare fuses over to the Owner and obtain receipt.

3.4 MOTOR CONTROL EQUIPMENT

A. Provide overload and fuses. Coordinate sizes with division 22 or 23 contractor.

B. Terminate control wiring. Coordinate with division 22 or 23 contractor.

C. Prior to releasing the starter and disconnect order the division 26 contractor shall obtain verification in writing from the division 22 and 23 contractors that all starter and disconnect sizes and types are correct. The division 26 contractor shall bear all cost if written approval is not obtained prior to releasing the order and size changes are required.

END OF SECTION 262913

SECTION 262923 – ADJUSTABLE-SPEED DRIVES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. All Adjustable Speed Drives will be furnished and installed by the Electrical contractor. The Electrical contractor shall provide all internal control wiring jumpers, communication card installation and network settings communicate with the temperature control system, overload settings, and factory startup.

C. The Division 22 and 23 contractors will furnish all adjustments and programming temperature controls system settings and sequences.

1.2 DESCRIPTION OF WORK

A. This section includes minimum requirements for variable speed motor controls referred to as Adjustable Speed Drives (ASD) also referred to as Variable Frequency Drives (VFD) or Variable Speed Drives (VSD).

B. The drive manufacturer shall supply the drive and all necessary options as specified. All drives installed on this project shall be from the same manufacturer and have a common user interface (control panel). The manufacturer shall have been engaged in the production of this type of equipment for a minimum of 15 years. Drives that are manufactured by a third party and “brand labeled” shall not be acceptable. Drive manufacturers who do not build their own power boards and assemblies, or do not have full control of the power board manufacturing and quality control, shall be considered as a “brand labeled” drive.

C. This section includes minimum requirements for the following:

1. Standard Adjustable Speed Drives; PROVIDE FOR MOTORS LESS THAN 25 HP

2. Ultra-Low Harmonic (ULH) Adjustable Speed Drives; PROVIDE FOR MOTORS GREATER THAN 20 HP

1.3 QUALITY ASSURANCE

A. All adjustable speed drives shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Each drive shall be subjected to the following test and quality control procedures.

1. Each new product design shall undergo a 4000-hour pre-production burn-in test. A minimum of ten units shall be used to accumulate this entire time. Each unit shall be temperature cycled between 32 and 100 degrees Fahrenheit.

2. Every ASD shall be functionally tested under motor load. During this load test the ASD shall be monitored for correct phase current, phase voltages, and motor speed. Correct Current Limit operation shall be verified by simulating a motor overload. Manufacturing test data on each drive shall be recorded and stored by the manufacturer.

3. Verification of proper factory presets shall performed on 100% of all parameters to ensure proper microprocessor settings. Verification that the proper factory settings are loaded correctly in the drive shall be done via the drive serial interface port. Any parameter changes that are required after the addition of options such as communication cards or bypass shall be verified in addition to the drive only defaults.

4. All options shall be functionally tested including operation of a motor in the bypass mode if supplied. Proper sizing and adjustment of the integral motor overload shall be set and verified.

C. Referenced Standards and Guidelines:

1. Institute of Electrical and Electronic Engineers (IEEE)

   a. IEEE 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems

2. Underwriters Laboratories

   a. UL 508, 508A, 508C

   b. UL 61800, 61800-5-1, 61800-5-2

   c. UL 1995

3. The Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA)

   a. NEMA ICS 7-2014, Adjustable Speed Drives

4. International Electrotechnical Commission (IEC)

   a. EN/IEC 61800

5. National Electric Code (NEC)

   a. NEC 430.120, Adjustable-Speed Drive Systems

6. CSA Group

a. CSA C22.2 No. 274

D. Qualifications:

1. Drives shall be UL labeled as a complete assembly. The base ASD shall be UL listed for 100 kA SCCR when installed in accordance with the manufacturer's guidelines.

2. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50% for up to 0.2 seconds, sags to 70% for up to 0.5 seconds, and sags to 80% for up to one second.

1.4 SUBMITTALS

A. Provide a summary list of all ASD's with the following information:

1. Bill of materials.

2. Dimension drawings.

3. Wiring diagrams.

4. Product data sheets including:

a. Integrated electrical protection.

b. Agency certifications.

c. Environmental tolerances.

d. Electrical characteristics including harmonic performance

e. Enclosure material and rating.

f. Control (inputs, outputs, power supplies).

g. Motor lead length @ 8 kHz carrier frequency.

5. List of all operator interface devices.

6. List of any exceptions to this specification.

1.5 START-UP SERVICE AND TRAINING

A. ASD's shall not be powered up without authorization from the ASD manufacturer. The contractor shall notify the ASD manufacturer when the units have been installed and shall schedule startup by a factory trained and authorized technician. This technician shall complete a startup report that records all ASD data, settings and a checklist of tests and observations. A copy of this test report shall be forwarded to the project Commissioning Authority and included in the Operation and Maintenance Manual.

B. The ASD factory trained, and authorized technician shall make all final adjustments as required for proper operation. Coordinate with the mechanical contractor and equipment vendors as required.

C. Provide one 2-hour training session on site by a ASD factory trained and authorized technician. This session shall review all operation and maintenance requirements plus the fundamentals of ASD's and their application to AC motors.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Provide one copy of complete documentation for each type of adjustable speed drive installed. Documentation shall be bound and included in the Operation and Maintenance Manuals required in this Specification. Documentation shall include the following:

1. Wiring diagrams

2. Schematics

3. Operating and maintenance manuals

4. Local service representative

5. Emergency on sight technical support information

6. Recommended maintenance procedures

7. Recommended spare parts list

2.0 PART 2 - PRODUCTS

2.1 COMMON ADJUSTABLE SPEED DRIVE CAPABILITIES

A. The drive package as specified herein shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer to ISO9001 standards.

B. The drive shall provide full rated output from a line of +10% to -10% of nominal voltage. The drive shall continue to operate without faulting from a line of +25% to -25% of nominal voltage.

1. Drives shall be capable of continuous full load operation under the following environmental operating conditions:

a. Ambient temperature -15 to 40° C (5 to 104° F).

b. Altitude 0 to 1000 m (0 to 3,300 ft) above sea level.

c. Humidity 5 to 95%, non-condensing.

2. Supply Connection:

   a. Voltage and power range:

      1) 3-phase

      2) Frequency: 48 to 63 Hz

      3) Fundamental power factor: 0.98

      4) Efficiency at rated power: 98%

3. Motor Connection:

   a. Supported motor types:

      1) Asynchronous motor

      2) Permanent magnet motor

      3) SynRm

   b. Voltage:

      1) 3-phase

      2) From 0 to supply voltage

      3) Frequency: 0 to 400 Hz

C. All drives shall utilize the same Advanced Control Panel (keypad) user interface.

1. Plain English text

   a. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable).

   b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.

   c. Safety interlock, run permissive, and external fault status shall have the option of additional customized project specific terms, such as: AHU-1 End Switch, Office Smoke Alarm, CT-2 Vibration.

2. The control panel shall include at minimum the followings controls:

   a. Four navigation keys (Up, Down, Left, Right) and two soft keys to simplify operation and programming.

   b. Hand-Off-Auto selections and manual speed control without having to navigate to a parameter.

c. Fault Reset and Help keys. The Help key shall include assistance for programming and troubleshooting.

3. Multiple Home View screens shall be capable of displaying up to 21 points of information. Customizable modules shall include bar charts, graphs, meters, and data lists. Displays shall provide real time graphical trending of output power, frequency, and current within selectable intervals of 15/30/60 minutes and 24 hours.

4. The control panel shall display the following items on a single screen; output frequency, output current, reference signal, drive name, time, and operating mode (Hand vs Auto, Run vs Stop). Bi-color (red/green) status LED shall be included. Drive (equipment) name shall be customizable.

5. There shall be a built-in time clock in the control panel. The clock shall have a battery backup with 10 years minimum life span. Daylight savings time shall be selectable.

6. I/O Summary display with a single screen shall indicate and provide:

   a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs. Drives that require access to internal or live components to measure these values, are not acceptable.

   b. The programmed function of all analog inputs, analog outputs, digital inputs, and relay outputs.

   c. The ability to force individual digital I/O high or low and individual analog I/O to desired value, for increased personal protection during drive commissioning and troubleshooting. Drives that require access to internal or live components to perform these functions, are not acceptable.

7. The drive shall automatically backup parameters to the control panel. In addition to the automatic backup, the drive shall allow two additional unique backup parameter sets to be stored. Backup files shall include a time and date stamp. In the event of a drive failure, the control panel of the original drive can be installed on the replacement drive, and parameters from that control panel can be downloaded into the replacement drive.

8. The control panel shall display local technical support contact information as part of drive fault status.

9. The control panel shall be removable, capable of remote mounting.

10. The control panel shall have the ability to store screen shots, which are downloadable via USB.

11. The control panel shall have the ability to display a QR code for quick access to drive information.

12. The LCD screen shall be backlit with the ability to adjust the screen brightness and contrast, with inverted contrast mode. A user-selectable timer shall dim the display and save power when not in use.

13. The control panel shall include assistants specifically designed to facilitate start-up. Assistants shall include: First Start Assistant, Basic Operation, Basic Control, and PID Assistant.

14. Primary settings for HVAC shall provide quick set-up of all parameters and customer interfaces to reduce programming time.

15. The drive shall be able to operate with the control panel removed.

D. All drives shall have the following hardware features/characteristics as standard:

1. Two (2) programmable analog 4-20mA inputs shall accept current or voltage signals. Current or Voltage selection configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.

2. Two (2) programmable analog 4-20mA outputs. At least one of the analog outputs shall be adjustable for current or voltage signal, configured via control panel. Drives that require access to internal components to perform these functions, are not acceptable.

3. Three (3) programmable Form-C relay outputs. The relay outputs shall include programmable on/off time delays. The relays shall be rated for a continuous current rating of 2 Amps. Maximum switching voltage of 250 VAC / 30 VDC. Open collector and Form-A relays are not acceptable. Drives that have less than (3) Form-C relay outputs shall provide an option card to provide additional relay outputs.

4. Drive terminal blocks shall be color coded for easy identification of function.

5. The drive shall include an isolated USB port for interface between the drive and a laptop. A non-isolated USB port is not acceptable.

6. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.

7. The drive shall have cooling fans that are designed for field replacement. The primary cooling fan shall operate only when required and be variable speed for increased longevity and lower noise levels. Drives whose primary cooling fans are not variable speed, shall include a spare cooling fan.

8. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute.

9. The input current rating of the drive shall not be greater than the output current rating. Per NFPA 70 430.122, drives with higher input current ratings may require the upstream wiring, protection devices, and source transformers to be upsized.

10. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.

11. Earth (ground) fault detection shall function in both modulating (running) and non-modulating modes.

12. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition. Drives that do not include coordinated AC transient surge protection shall include an external TVSS/SPD (Transient Voltage Surge Suppressor/Surge Protection Device).

13. The drive shall include a robust DC bus to provide short term power-loss ride through. The DC bus Joule to drive kVA ratio shall be 4.5 J/kVA or higher. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.

E. All drives shall have the following software features as standard:

1. A Fault Logger that stores the last 16 faults in non-volatile memory.

   a. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.

   b. The date and time of each fault and fault reset attempt shall be stored in the Fault Logger.

2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory.

   a. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, and automatic reset of a fault.

   b. The date and time of each event's start and completion points shall be stored in the Event Logger.

3. Programmable start method. Start method shall be selectable based on the application: Flying-start, Normal-start, and Brake-on-start.

4. Programmable loss-of-load (broken belt / coupling) indication. Indication shall be selectable as a control panel warning, relay output, or over network communications. This function to include a programmable time delay to eliminate false loss-of-load indications.

5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in "Watts." Heating functions based only on "percent current" are not acceptable.

6. Advanced power metering abilities shall be included in the drive. Drives without these data points, must include a separate power meter with each drive.

    a. Instantaneous output power (kW)

    b. Total power, broken down by kWh.

    c. Time based kWh metering for: current hour, previous hour, current day, and previous day.

    d. Energy saving calculation shall be included that shows the energy and dollars saved by the drive.

7. The drive shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.

8. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command, the Drives shall provide a dry contact closure that will signal the damper to open. When the damper is fully open, an end-switch shall close, allowing the drive to run the motor.

    a. The drive shall also include a programmable start delay, for when an end-switch is not provided.

9. Start interlock circuit - Four separate start interlock (safety) inputs shall be provided. When any safety is opened, the motor shall be commanded to stop. The control panel will display the specific safety(s) that are open. The status of each safety shall be transmitted over the network communications. Wiring multiple safeties in series is not acceptable.

10. External fault circuit – Three separate external fault inputs shall be provided. This circuit shall have the same features and functionality as the start interlock circuit, except it shall require a manual reset before the drive is allowed to operate the motor.

11. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature, and allows higher switching frequency settings without derating the drive. It shall be possible to set a minimum and a target switching frequency.

12. The drives nameplate horsepower shall be fully rated at 8kHz switching frequency with a minimum motor lead length of 150 feet.

13. Visual function block adaptive programming allowing custom control schemes, minimizing the need for external controllers. I.e. cooling tower staging logic. A free software tool shall be used to configure adaptive programming.

14. The ability to automatically restart after an over-current, over-voltage, under-voltage, external fault, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable. Each of these faults may have automatic restart individually disabled via a parameter selection.

15. Three (3) programmable critical frequency lockout ranges to prevent the drive from operating the load continuously at an unstable speed/load.

16. Seven (7) programmable preset frequencies/speeds.

17. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.

18. PID functionality shall be included in the drive.

    a. Programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped based on the level of a process feedback signal.

    b. The drive shall include an independent PID loop for customer use, assigned to an Analog Output. This PID loop may be used for cooling tower bypass valve control, chilled water valve, etc.

19. At least 4 parameter user sets that can be saved to the permanent memory and recalled using a digital input, timed function, or supervision function.

20. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source, allowing the drive control to remain powered by a UPS during an extended power outage.

21. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.

22. The drive shall include a fireman's override mode. Upon receipt of a contact closure from the Fire Alarm Life Safety system, the drive shall operate in a dedicated Override mode distinct and separate from the drive's Normal operation mode. The following features will be available in the drive override function:

    a. The Override mode shall be secured by password to prevent changes once programmed.

    b. The drive shall ignore external inputs and commands not defined as part of the override function.

    c. Override operation mode shall be selectable between: single frequency, multiple fixed frequencies, follow an analog input signal, PID control, or come to a forced stop.

    d. High priority safeties shall stop the drive and lower priority safeties shall be ignored in Override mode.

e. The drive shall be configurable to receive from 1 to 3 discrete digital input signals and operate at up to three discrete speeds.

23. The drive shall have multi-pump functionality and an intelligent master/follower configuration for controlling up to 8 parallel pumps equipped with drives. The drive shall have a parameter synchronization feature to program the PID, multi-pump, and AI parameters in all parallel drives. The functionality to start and stop the pumps based on capacity, operating time or efficiency of the pump to ensure each pump is operated regularly.

a. The multi-pump functionality shall control:

1) Flow Control

2) Pressure Control

3) Pump Alternation

F. Security Features

1. The drive manufacture shall clearly define cybersecurity capabilities for their products.

2. The drive shall include password protection against parameter changes.

a. There shall be multiple levels of password protection including: End User, Service, Advanced, and Override.

b. The drive shall support a customer generated unique password between 0 and 99,999,999.

c. The drive shall log an event whenever the drive password has been entered.

d. The drive shall provide a security selection that prevents any “back door” entry. This selection even prevents the drive manufacturer from being able to bypass the security of that drive.

e. A security level shall be available that prevents the drive from being flashed with new firmware.

3. The “Hand” and “Off” control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.

G. Network Communications

1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2.

2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card-based protocol. Once installed, the drive shall automatically recognize any optional communication cards without the need for additional programming.

3. The drive shall not require a power cycle after communication parameters have been updated.

4. The drive's relay output status, digital input status, analog input/output values, Hand-Auto status, warning and fault information shall be capable of being monitored over the network. The drive's start/stop command, speed reference command, relay outputs and analog outputs shall be capable of being controlled over the network. Remote drive fault reset shall be possible.

H. Disconnect – A circuit breaker shall be provided on all drives. The disconnect shall be door interlocked and padlockable. Drive short circuit protection shall be included on all packaged units that include a disconnecting means. All disconnect configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Disconnect packages manufactured by anyone other than the drive manufacturer, are not acceptable.

I. Bypass – Bypass drive packages shall be provided as indicated on the drive schedule. All drive/bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. Bypasses manufactured by anyone other than the drive manufacturer, are not acceptable.

1. The drive and bypass package shall be a complete factory wired and tested bypass system consisting of a padlockable disconnect device, drive output contactor, bypass contactor, and drive input fuses.

2. The drive and bypass package shall have a UL listed short circuit current rating of 100 kA, for 240 VAC and 480 VAC systems, and this rating shall be indicated on the rating label.

3. The bypass control shall be powered by a three-phase switch mode power supply with a voltage tolerance of +30%, -35%. Single-phase power supplies and control power transformers (CPT) are not acceptable.

4. The drive and bypass package shall be seismic certified and labeled to the IBC. Seismic importance factor of 1.5 rating is required, and shall be based upon actual shake table test data as defined by ICC AC-156. Seismic certification of equipment and components shall be provided by OSHPD preapproval.

5. All bypass packages shall utilize a dedicated LCD bypass control panel (keypad) user interface. The bypass control panel must be a separate display from the drive control panel. Bypass packages that use a single shared drive/bypass control panel are not acceptable, due to that control panel acting as a single point of failure.

    a. The bypass shall include a two-line, 20-character LCD display. The display shall allow the user to access parameters and view:

        1) Bypass input voltage, current (Amps) and power (kW)

        2) Bypass faults, warnings, and fault logs

        3) Bypass operating time and energy consumption (resettable)

    b. The bypass control panel shall include the following controls:

        1) Four navigation keys (Up, Down, Enter, Escape)

        2) Bypass Hand-Off-Auto, Drive mode / Bypass mode selectors, Bypass fault reset

    c. The following LED indicating lights or control panel display indications shall be provided.

        1) Drive mode selected, Bypass mode selected

        2) Drive running, Bypass running

        3) Drive fault, Bypass fault

    d. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch, smoke alarm, vibration trip, and overpressure.

6. All bypasses shall have the following hardware features/characteristics as standard:

    a. Six (6) digital inputs and five (5) Form-C relay outputs. The digital inputs shall be capable of accepting both 24 VDC and 24 VAC. The bypass control board shall include an auxiliary power supply rated 24 VDC, 250 mA.

    b. Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable. Third contactor “isolation contactors” and service switches are not an acceptable alternative to drive isolation fuses.

    c. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.

d. The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive's control board has failed. Network communications shall remain functional. Bypass systems that do not maintain full functionality in the event of a drive failure, are not acceptable.

7. All bypasses shall have the following software features as standard:

a. Programmable loss-of-load (broken belt / coupling) indication shall be functional in drive and bypass mode.

b. The bypass shall also support run permissive and start interlock control functionality, including start delay, as previously specified in the drive section.

c. The bypass control shall monitor the status of the drive and bypass contactors and indicate when there is a welded contactor contact or open contactor coil.

d. The bypass shall include a selection for either manual or automatic transfer to bypass. The automatic transfer mode shall allow the user to select the specific drive fault types that result in an automatic transfer to bypass. The automatic transfer mode shall not allow a transfer to bypass on motor related faults. Automatic transfer schemes that do not differentiate between fault types, are not acceptable.

e. The bypass shall include the ability to select the operating mode of the system (Drive/Bypass) from either the bypass control panel or digital input.

f. The bypass shall include a supervisory control mode that monitors the value of the drive's analog input (feedback). This feedback value is used to control the bypass contactor on/off state. The supervisory mode shall allow the user to maintain hysteresis control over applications such as cooling towers and booster pumps.

g. Selectable Class 10, 20, or 30 electronic motor overload protection shall be included in both drive and bypass mode.

h. The drive and bypass shall be designed to operate as an integrated system when in Override mode. Whether operating in drive or bypass mode, the low priority safeties will be ignored, and high priority safeties will be followed. External start/stop commands will be ignored. There shall be four selectable Override modes:

1) Bypass only, with two smoke control modes:

(a) Fixed pre-configuration of digital inputs

(b) Configurable high/low priority safeties and faults, to allow configuration to meet needs of local Authority Having Jurisdiction.

2) Drive only

3) Drive then transfer to bypass, in the event of a drive fault

4) Force to Stop

8. The bypass relay output status, digital input status, warning and fault information can be monitored over the network. Status information shall be monitored, including; operating mode (drive vs bypass), current drawn in bypass mode, broken belt, and phase-to-phase voltage. The bypass start/stop command, force to bypass command, and relay outputs shall be capable of being controlled over the network.

2.2 STANDARD ADJUSTABLE SPEED DRIVE

A. Technology and Harmonics Performance:

1. The standard ASD shall produce an adjustable AC voltage / frequency output. It shall be of the pulse-Width Modulated (PWM) technology and shall consist of a 6-pulse minimum full-wave diode bridge converter to convert incoming AC utility power to DC power, a capacitor filter/storage network and an inverter power transistor switching output section. The microprocessor controller generating inverter output shall include the internal base driver and specified protection and sensing circuits. The ASD waveform generator shall be IGBT based and capable of extended carrier frequency operation.

2. Provide all standard adjustable speed drives less than 25 horsepower with dual (positive and negative DC link) chokes equivalent to 5% to reduce the harmonics to the power line.

3. Harmonic Performance: THD <45% above 60% load

B. Design Make: ABB ACH580 Series

C. Acceptable Equivalents:

1. Danfoss VLT HVAC Series

2. Eaton PowerXL DH1 HVAC Series

3. Yaskawa HV600 Series

2.3 ULTRA-LOW HARMONIC (ULH) ADJUSTABLE SPEED DRIVE

A. Technology and Harmonics Performance:

1. The ULH ASD shall produce an adjustable AC voltage / frequency output. It shall use Active Rectification with integrated power modules technology to convert incoming AC utility power to DC power, a capacitor filter/storage network and an inverter power transistor switching output section. The microprocessor controller generating inverter output shall include the internal base driver and specified protection and sensing circuits. The VFD waveform generator shall be IGBT based and capable of extended carrier frequency operation.

2. The ASD shall have an active line supply unit which controls the waveform of the input current and reduces the low order harmonic current drawn from the power line. Line currents and voltages shall be nearly sinusoidal. IGBTs shall be used in the rectified and inverter circuits.

3. Harmonic Performance: THD <5% above 60% load

4. Eliminates all regenerative power contribution to input.

B. Design Make: ABB ACH580-31 Series

C. Acceptable Equivalents:

1. Danfoss VLT PHD-102 Series

2. Yaskawa U1000 Series

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Install incoming 60Hz power conductors and frequency modulated conductors in separate conduits.

B. Electrical contractor to provide fire alarm fan shut down relay connection between I/O's "12" and "18". Provide normally closed connection such that the connected air handler supply or return fan motor stops when the fan shut down relay is actuated. This relay shall be installed in series with the DDC system start/stop signal.

C. Install ASD in an accessible location. Refer to contract documents for more information.

D. Motor lead lengths shall not exceed manufacturers recommendations as described in part 2 of this section.

E. Provide all start up services and training as described in part 1 of this section.

F. Completely assemble and provide connections to all terminal or terminal strips and any miscellaneous control devices.

G. Input and motor leads for each ASD shall be in a separate dedicated steel conduit.

H. Adjust drive controls in accordance with manufacturer's requirements. Switching frequency shall have an initial set point of 6 KHz.

I. Coordinate entire installation, including communications interface with the temperature control contractor prior to ordering ASD.

J. Provide factory trained representative and drive programming as required to meet temperature controls sequence of operation.

K. Coordinate controls programming with the Division 22 or 23 contractor.

L. When the ASD is located remotely from the motor and the associated disconnect switch, provide an interlock in the disconnect switch and provide 2-#12AWG in ½" C from the ASD to the interlock. This shall be interfaced to disable the ASD prior to disconnection of power to the motor.

3.2 COORDINATION

A. Provide motor overload programming for connected load. Coordinate sizes with Division 22 or 23 contractor.

B. Provide all terminations of control wiring and coordinate with Division 22 or 23 contractor.

C. Prior to releasing the adjustable speed drive order the Division 26 contractor shall obtain verification in writing from the Division 22 and 23 contractors that all sizes and types are correct. The Division 26 contractor shall bear all cost if written approval is not obtained prior to releasing the order and size changes are required.

3.3 WARRANTY

A. The drive product warranty shall be 24 months from the date of installation and programming. The warranty shall include parts, on-site labor, and travel time and travel costs, or replacement of the complete drive as determined by the drive manufacturer's technical support representative.

END OF SECTION 262923

SECTION 265100 - LIGHTING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide complete installation, including luminaires, standards, hangers, supports, fittings, lamps, wiring, and connections as indicated in the Contract Documents. Types of luminaires in this project include LED.

B. Refer to the General and Supplementary Conditions, Division 1 Specifications Sections for proposed phasing of this project.

C. Refer to Specification Section 019113 for commissioning requirements related to this project.

D. Refer to section 260923 for Wired Lighting Controls.

1.2 SCOPE OF WORK

A. This section includes minimum requirements for the following:

1. LED Luminaires
2. LED Drivers
3. Lamps
4. Emergency Driver
5. Automatic Load Control Relay
6. Branch Circuit Emergency Lighting Transfer Switch
7. Diffusers
8. Light Poles and Standards

1.3 SUBMITTALS

A. Submit shop drawings as described in Section 260010. All luminaire types and components shall be submitted in a single complete brochure which shall be in the form of a soft cover binder with each luminaire separated by an identified index tab. Information on each luminaire shall include:

1. Manufacturer and Catalog Number.
2. Dimensioned Construction Drawing(s).
3. Standard Catalog "Cut" Sheet.
4. Lumen Output

5. CRI and Kelvin Temperature

6. Lens/Louver Type.

7. Driver w/ Dimming Technology

8. Lamp Type.

9. Lumen Loss Information

B. Emergency Driver

C. Automatic Load Control Relay [ALCR]

D. Branch Circuit Emergency Lighting Transfer Switch [BCELTS]

E. Light Poles and Standards

F. Warranty Information

1.4 QUALITY ASSURANCE

A. Luminaires shall be standard products of manufacturers regularly engaged in the manufacture of the specific type luminaires specified and shall be the manufacturer's latest standard design that complies with specification requirements. Firms installing the luminaires shall have a minimum of five (5) years of successful installation experience on projects with interior lighting work similar to the requirements of this project.

B. Codes and Standards

1. NEC:

a. Shall comply with Articles 220, 410, 510 and 700 as applicable to installation and construction.

2. NEMA:

a. Shall comply with Standard Publication Nos. LE 1 and LE 2 as applicable to lighting equipment.

3. UL:

a. All interior lighting luminaires and components shall be UL listed and labeled.

b. Comply with all applicable UL standards including UL 486A and B.

4. CBM:

a. Fluorescent and HID ballasts shall comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

5. All work shall comply with applicable local code requirements of the authority having jurisdiction.

C. Verify the availability of all luminaires proposed to be used in the execution of the work prior to submitting for approval. The discontinuance of production of any luminaire after such approval has been granted shall not relieve the Contractor from furnishing an approved luminaire of comparable quality and design at no additional cost.

D. Luminaires shall be as specified in the "Luminaire Schedule." Luminaire types, characteristics, photometrics, finishes, etc., correspond to the first manufacturer, and associated catalog number, listed in the "Luminaire Schedule." Provide a sample luminaire from the factory for any products not listed as acceptable for approval. The Owner's Representative reserves the right to disapprove any luminaire type submitted which is not equal in quality, appearance or performance to the luminaire specified.

E. All luminaires shall meet the Total Luminaire Efficiency (TLE) requirements of the New York State Energy Conservation Construction Code.

2.0 PART 2 - PRODUCTS

2.1 LED LUMINAIRES

A. General:

1. Manufacturers shall be a registered with the Department of Energy (DOE) as a Quality Advocate and taken the pledge to be listed on the LED lighting facts website.

2. Luminaire measurements have been standardized and are in compliance with IESNA Standard LM-79 test procedure.

3. LED’s have been standardized and are in compliance with IESNA Standard LM-80 and demonstrate L70 life after 50,000 hours.

4. Luminaires shall be either Energy Star certified, or Design Lights Consortium (DLC) listed to qualify for NYSERDA or Utility provider rebate incentives. Submitted luminaires not currently on the DLC or Energy Star listed products list (http://www.designlights.org/) will be rejected.

5. Manufacturers shall prove color consistency across all LED’s via 3 step MacAdam Ellipse.

6. Luminaires shall be tested at an ambient temperature of +25 degrees for a minimum of 6000hrs.

7. Maximum junction temperature of 80°C.

8. Minimum drive current of 350mA. Maximum drive current of 700mA.

9. All LED luminaires shall have a minimum Color Rendering Index (CRI) of 80.

10. Luminaires shall a minimum 5-year warranty.

11. Refer to Luminaire Schedule on drawings for complete Luminaire makes and models.

2.2 LED DRIVERS

A. Dimmable Driver (0-10v):

1. Drivers shall be of the constant current type.

a. Voltage: 120/277 as noted on drawing

b. Driver Current: 350mA – 700mA.

c. 0-10v dimming capable down to 1%.

d. Maximum THD: 10%

e. Minimum Power Factor: 0.9

2. Acceptable Manufacturers.

a. eldoLED - ECOdrive

b. Signify Advance – Xitanium

c. Osram Sylvania – Optotronic

d. Lutron Hi-lume

2.3 LAMPS

A. LED Replacement Lamps

1. LED T8 32W Replacement

a. LED replacement for fluorescent T8 lamps shall be 16w, bypass style. All lamps shall have a minimum CRI of 80, a minimum of 110 lumens per watt and meet all requirements of the New York State Energy Conservation Construction Code.

b. Correlated Color Temperature of 4,000K (Kelvin)

c. LED replacement for 2-ft Fluorescent T8 lamps – 8 Watts, 1050 rated lumens, 50,000hr lamp life, 160 beam angle, 131 LPW, 80 CRI, not dimmable.

d. LED replacement for 4-ft Fluorescent T8 lamps – 16 Watts, 2050 rated lumens, 50,000hr lamp life, 160 beam angle, 114 LPW, 80 CRI, not dimmable.

e. LED replacement for Fluorescent T8 lamps with driver is acceptable as an alternative to bypass type lamps. At time of submittal contractor shall supply lamp and driver information sheet.

f. Acceptable Manufacturers:

1) Green Creative

2) TCP Lighting

3) Philips Lighting

4) Approved Equal

2. Type A-19 Replacement lamp shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
6	480	80 lm	3000	80	25,000 hrs	40
9	800	88 lm	3000	80	25,000 hrs	60
15	1600	106 lm	3000	80	25,000 hrs	100

3. Type BR30 Replacement lamp shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
13	1400	63 lm	3000	83	25,000 hrs	65

4. Type CA11 Replacement candelabra lamp with E12 base shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life Based on L70	Equivalent Incandescent Wattage
4	300	75 lm	3000	80	15,000 hrs	60

5. Type CA11 Replacement candelabra lamp with E26 medium screw base shall have the following characteristics:

Wattage	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life	Equivalent Incandescent Wattage
5	300	60 lm	3000	80	15,000 hrs	60

6. Type MR16 2-Pin GU5.3 base replacement lamp shall have the following characteristics for use on 12 Volt system:

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
4	25°	300	60 lm	2700	82	25,000	20
4	35°	300	60 lm	2700	80	25,000	20
7	25°	500	55 lm	3000	80	25,000	50
7	35°	500	66 lm	3000	80	25,000	50

7. Type PAR 38 Replacement flood lamp E26 medium screw base

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
12	12°	660	55 lm	2700	82	25,000	40
12	25°	660	55 lm	2700	82	25,000	40
12	35°	660	55 lm	2700	82	25,000	40

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
18	12°	1200	70 lm	3000	90	50,000	60
18	25°	1200	70 lm	3000	90	50,000	60
18	40°	1200	70 lm	3000	90	50,000	60

Wattage	Beam Spread	Initial lumens	Efficacy	Color Temperature	CRI	Avg. rated life (Hrs)	Equivalent Incandescent Wattage
26	12°	1500	58 lm	3000	82	50,000	100
26	25°	1500	58 lm	3000	82	50,000	100
26	40°	1500	58 lm	3000	82	50,000	100

8. Acceptable Replacement Lamp Manufacturers

   a. General Electric

   b. Philips

   c. Sylvania/Osram

2.4 EMERGENCY DRIVER

A. Emergency Ballast shall be installed in conjunction with LED Driver intended for normal luminaire operation. Contains internal battery that shall automatically switch over to power designated lamp(s) upon loss of normal power via internal voltage sensing device. Battery shall be maintenance free, nickel-cadmium type, and be an integral part of ballast assembly. Life expectancy of battery shall be minimum of seven years.

B. All emergency ballasts shall be inverter type with Class 2 Output.

C. UL listed metal enclosure.

D. UL 924 listed for Emergency Lighting and Power Equipment

E. Temperature Operation: 20°C to +55°C

F. Shall include an emergency test switch with LED indicator remotely mounted in outlet box in ceiling above or adjacent to luminaire.

G. Recessed LED Downlight Luminaire LED performance – Shall up to 300 lumens minimum of 90 minutes on an output voltage of 30-130VDC. Design Makes: LED – Bodine BSL17 Series

H. Linear style LED Strip LED performance – Shall up to 1,000 lumens minimum of 90 minutes on an output voltage of 15 - 52 VDC. Design Makes: LED – Bodine BSL310 Series

I. Acceptable Manufacturers.

a. Bodine BSL Series

b. IOTA Engineering

c. Dual-lite

2.5 AUTOMATIC LOAD CONTROL RELAY

A. Automatic Load Control Relay:

1. Mounts in standard 4” square backbox.

2. Input circuit is always from emergency power with a normal power sensing circuit.

3. Single circuit over-ride.

4. Output: Connection to AC ballast/driver.

5. 0-10 VDC / DALI dimmer override to full brightness upon loss of normal power.

6. Line voltage bypass/shunt.

7. Rated: 120-277V, 10-amps for single luminaire installation only

8. UL 924 listed for Emergency Lighting and Power Equipment

9. UL 2043 listed for plenum installation.

10. Integral, unit mounted test switch.

11. Minimum 5-year limited warranty

12. Design Make: Evenlite ELCD 924 Series

13. Approved Equals:

    a. Current Lighting NX Controls ALCR1277 Series

    b. Isolite ELCD 924 Series

    c. Myers Emergency Power Systems EPC-2-D Series

    d. Bodine GTD10DIM Series

    e. Leviton ECS Series

2.6 BRANCH EMERGENCY LIGHTING TRANSFER SWITCH

A. Transfer switch shall be installed in conjunction with normal and emergency power circuits intended for switched and automatic emergency luminaire operation. Designed to automatically switch over to emergency circuit upon loss of normal power via internal voltage sensing device.

B. Allows standard switching of Luminaire on normal power circuit.

C. Inputs:

1. Normal power switched circuit

2. Normal power unswitched circuit

3. Emergency power unswitched circuit

D. Output: Connection to lighting circuit maximum of 16 amps

E. 0-10 VDC / DALI dimmer override to full brightness upon loss of normal power

F. Short circuit withstand rating capability of 10kA.

G. Rated: 120-277V, 20-amps for multiple luminaires on the circuit

H. UL 1008 Listed Transfer Switch.

I. Integral, unit mounted test switch.

J. Minimum 3-year warranty limited warranty.

K. Design Make: Evenlite ELCD1008

L. Approved Equals:

1. Current Lighting NX Controls UL1008CELTS series
2. Isolite ELCD 1008 series
3. Myers Emergency Power Systems EPC-D-F-ATS Series
4. Bodine GTD20A series
5. Leviton ECD series

2.7 DIFFUSERS

A. Lenses:

1. Extruded 100 percent virgin acrylic material with a minimum weight of ten ounces per square foot.
2. Type 12 - Clear material with 0.125 inch overall thickness with .080 Inch penetration comprised of 3/16 inch square based female cones aligned 45 degrees to the length and width of the panel.
3. Type 19 - Clear material with 0.156 inch overall thickness with 0.080 inch penetration comprised of 3/16 inch square based male cones aligned parallel and perpendicular to the length and width of the panel.
4. White matte - White material with 0.125 inch overall thickness.
5. While overlay - White material with 0.040 inch overall thickness.
6. The maximum deflection at the center of a 2 foot x 4 foot lens shall be no greater than 0.250 inch. Arched or warped lenses will not be accepted.
7. Parabolic Louvers
    a. Medium cell louver - One piece injection molded acrylic, with all parabolic surfaces prepared with a primary undercoat, highly specular vacuum metalized finish, and encapsulated in a protective acrylic lacquer coating. Cell dimensions shall be nominal 1-1 /2 inches x 1-1 /2 inches x I inch deep, and shall provide approximately 38 degree shielding with a louver efficiency of not less than 52 percent. This louver shall have a VCP index rating of 0.93 for semi-specular silver finish. Panel finish shall be specular silver.

8. Baffles and Louvers

   a. Cross Baffle - Constructed of 0.050 inch aluminum with one-way blades to provide 45 degree shielding. Blades 1-1/2 inches high and spaced 1-1/2 inches apart. While enamel finish. Side shields for support of the blades. Width to extend the full width of the lighting unit and of lengths to form a continuous baffle with no visible joints. Where inside and outside comers are required, the blades shall be mitered.

   b. Parabolic Baffle - Constructed of 0.050 inch aluminum with one-way blades to provide 45 degree shielding. Blades 1-1/2 inches high and spaced 1-1/2 Inches apart. Clear anodized finish. Side shields for support of the blades. Width to extend the full width of the lighting unit and lengths to form a continuous baffle with no visible joints. Where inside and outside comers are required, the blades shall be mitered.

   c. Directional Louver - Constructed and fabricated of aluminum with a "cold bonding joint method for integral vibration free and precise alignment of cells. Louver finish shall be custom color as directed by the Architect.

2.8 LIGHT POLES AND STANDARDS

A. Metal Pole Lighting Standards: Provide metal, raceway-type, lighting poles and standards, of sizes and types indicated, comprised of shafts and tenon joints. Equip with grounding connections readily accessible from handhole base access doors; and construct of the following materials and additional construction features:

   1. Material: Aluminum Galvanized steel

   2. Configuration: Anchor base type with hand hole and cover.

   3. Metal Lighting Standard Accessories: Provide accessories for metal lighting standards, including anchor bolts, as recommended by lighting standard manufacturer, of sizes and materials needed to meet erection and loading application requirements.

   4. Provide metal seamless square anchor bolt cover to match pole construction.

   5. Provide pole with adequately sized reinforced handhole complete with matching cover 18" above grade level. Weld 1/2' grounding nut on shaft with accessibility from handhole. Design poles to withstand loads developed by 100 MPH wind pressure, as adjusted for height above ground level, structural shapes and cable wire loading.

B. Integrated Controls: Provide Qty. (2) wireless remote controls to make control adjustments for all required photocell sensor setpoints, occupancy sensor sensitivity, and associated delays.

C. All exterior light poles shall include integral surge-arrestors to protect the luminaire and driver. Surge Arrestor Design Make: Ditek DTK-DL Series.

2.9 LUMINAIRE SCHEDULE

A. Luminaire schedule is found on the drawings.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which luminaires are to be installed, and substrate for supporting luminaires. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Refer to respective reflected ceiling plan for each area. Reflected ceiling plans indicate proper luminaire location only. Locate occupancy sensors and photo sensors per the manufacturer’s recommendations. Coordinate the proper arrangement with all other ceiling mounted items. Contract Documents indicate luminaire characteristics (type), quality, quantity, etc. Verify with the ceiling supplier design of actual ceiling installed in each area and coordinate compatible luminaire flange/trim type.

B. General

1. Install interior luminaires at locations and heights as indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA's 'Standard of Installation", NEMA standards, and with recognized industry practices.

2. Provide luminaires and/or luminaire outlet boxes with hangers to properly support luminaire weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Engineer.

3. Make installation such that the luminaire is free of finger marks, flaws, scratches, dents or other imperfections.

4. Arrangement

a. Align edges of luminaires with walls or other building elements. Where indicated by dimensions or indicated on Drawings, maintain indicated arrangement.

b. For wall to wall installed luminaires, field measure length required after completion of the wall construction and prior to ordering the luminaires. Fabricate in largest lengths allowable.

5. Recessed Mounting

   a. Verify ceiling construction and material prior to ordering luminaires. Provide plaster frames for plaster ceilings and flanged frames for drywall ceiling. Provide necessary mounting hardware and accessories to adapt luminaire to ceiling construction. Provide gaskets, trims, flanges, etc. as required to prevent light leaks around trim. Where installing 'lay-in' type luminaires, each Luminaire shall be supported completely independent of the ceiling system by way of 12-AWG galvanized steel support wires. Support wires shall be attached from all four corners of the Luminaire housing to the building structure. Each support shall be capable of supporting 100 pounds. Provide saddle hangers or tie bars attached to runners or between crossbars of ceiling systems as a safety measure. Provide mounting splines or other positive means of maintaining alignment and rigidity.

6. Stem Mounting

   a. Use self-aligning hangers in canopies for hanging luminaires true to vertical. Do not deface ceiling or walls. Locate hangers at intersections of joints or at centers of blocks in rooms with patterned type ceiling materials such as acoustic tile. Use hangers capable of supporting four times luminaire weight. Align continuous rows of luminaires maintaining luminaires level without rotation about the longitudinal axis. Rigidly support outlet box independent of ceiling system from building structure. Where obstructions prevent direct support of outlet, provide offset or trapeze hangers of outlet box. Stem shall be supported directly from building structure on centers as called for by the manufacturer. There shall be a minimum of two stems per individual four-foot luminaire, and three stems per individual eight foot luminaire for steel luminaires. Extruded aluminum luminaires shall have hangers as called for by the manufacturer.

   b. Provide brackets from the manufacturer of the same finish and material as the luminaires to present a seamless continuous row mounting appearance. Provide continuous row mounting brackets between all adjoining luminaires.

7. Surface Ceiling Mounting

   a. Mount surface luminaires tight to surface without distorting surface. Space luminaires in continuous rows to correspond to ceiling joint intersections. Continuous row luminaires may be fed by a single outlet where luminaires contain approved wireways and suitable wiring is used. Provide hangers for each luminaire, each rated to support four times the luminaire weight. Provide offset or trapeze hangers where required. Supports shall be provided on a maximum of 4-foot centers with a minimum of two hangers per individual four foot luminaire and three hangers per individual eight foot luminaire. Hangers shall be supported from the building structure and independently from ceiling system or other building services.

b. Fasten luminaires securely to structural supports.

3.3 DELIVERY, STORAGE, AND HANDLING

A. Luminaires and equipment shall be delivered with UL and manufacturer's labels intact and legible in factory fabricated containers.

B. Luminaires and accessories shall be stored in protected dry locations in their original unbroken package or container. Luminaires shall be protected from dust and dampness both before and after installation. Luminaires shall be protected from paint and cleaning solvents during all phases of construction.

C. Handle interior lighting luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged luminaires or components; replace them with new.

3.4 SEQUENCING AND SCHEDULING

A. Coordinate with other work including ceiling type, wires/cables, electrical boxes, fittings, and raceways, to properly interface installation of interior luminaires with other trades.

3.5 REUSE AND REPAIR OF EXISTING LUMINAIRES

A. Reuse existing luminaires only where called for. Perform the following work, as required, to upgrade existing luminaire. Replace faulty, leaking, or noisy ballast. Replace broken, damaged, worn, or faulted lamp sockets. Provide new luminaire wire. Provide new acrylic lens system to match existing, where existing is broken. Re-lamp luminaires. Completely damp clean lens and interior of luminaires.

B. If ballasts have leaked, remove material deposited in luminaire. Assume material was PCB contamination, or a test samples to show material is not PCB and submit a report. Dispose of material as required by EPA, including clean-up materials used. Dispose of ballast which does not have non PCB label in PCB containers and have containers taken to EPA approved incinerators. Follow all EPA regulations for transporting material.

C. New luminaires may be provided to replace existing luminaires scheduled to remain or be reused, subject to shop drawing approval.

3.6 REMOVAL OF BALLAST IN EXISTING LUMINAIRES

A. Assume ballast contains PCB materials unless labeled otherwise or test samples to show materials are not PCB; submit test report. Remove all ballast from existing luminaires indicated on contract documents. Dispose of all ballast which do not have non-PCB labels in PCB containers and pay all costs to have containers taken to EPA approved incinerators and disposed of per all EPA regulations. Follow all EPA regulations for transporting containers and materials. If ballast has leaked in the existing luminaire, remove material deposited in luminaire and dispose of those materials as listed above. Provide Certificate of Disposal and all associated paperwork to Owner’s representative.

3.7 REMOVAL OF LAMPS IN EXISTING LUMINAIRES

A. Assume all fluorescent lamps contain Mercury materials unless labeled otherwise or test samples to show materials do not contain Mercury and submit test report. Remove all lamps from existing luminaires indicated on contract documents. Dispose of all lamps which do not have non-Mercury labels in compliance with the requirements of the New York State Department of Environmental Conservation and all applicable Federal Laws. Follow all regulations for transporting materials. Provide Certificate of Disposal and all associated paperwork to Owner's representative.

3.8 LIGHT POLES AND STANDARDS

A. Paint all scratch marks on poles with factory supplied touch-up paint.

B. Locate the surge-arrestor in the light pole base for accessibility.

3.9 EMERGENCY DRIVERS

A. Provide separate non-switch conductor from line side of lighting circuit to each emergency driver voltage sensing input. Refer to manufacturers wiring diagram.

B. Connect all emergency drivers to allow switching unless luminaire is specifically shown to be used as a night light.

C. Provide adhesive 1" diameter round red sticker on all luminaires with internal emergency drivers.

D. Provide remote test switch or testing means for all emergency drivers accessible from below ceiling.

3.10 AUTOMATIC LOAD CONTROL RELAYS

A. Provide normal and emergency branch circuit wiring and connect per the manufacturer's wiring diagram. Units shall be wired to allow local switching and/or dimming under normal conditions. Upon loss of normal power, local switching and/or dimming shall be bypassed, overriding the controlled luminaires to full brightness regardless of the switched input state.

B. Provide panelboard/circuit labeling on the device or unit mounted junction box to indicate the normal and emergency branch circuits connected to it. Labeling shall not obscure the integral test switch or LED indicators.

C. Install the device in an accessible location suitable for the environment in which it is listed. Document the installed location on the as-built drawings.

3.11 BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCHES

A. Provide normal and emergency branch circuit wiring and connect per the manufacturer's wiring diagram. Units shall be wired to allow local switching and/or dimming under normal conditions. Upon loss of normal power, load output power shall be automatically transferred to the emergency input thus entering the emergency mode of operation. In emergency mode, all local switching and/or dimming shall be bypassed, overriding the controlled luminaires to full brightness regardless of the switched input state.

B. Provide panelboard/circuit labeling on the device or unit mounted junction box to indicate the normal and emergency branch circuits connected to it. Labeling shall not obscure the integral test switch or LED indicators.

C. Install the device in an accessible location suitable for the environment in which it is listed. Document the installed location on the as-built drawings.

3.12 LAMPS

A. Provide lamps in all luminaires.

B. Replace any lamp whose color is determined to be unsatisfactory. Replace all lamps which are found to have failed during the 12 month warranty period.

C. All lamps shall be new and unused. If permanent lighting system is used for temporary construction lighting, lamps shall be replaced upon turn over to Owner.

D. Furnish stock or replacement lamps amounting to 15%, but not less than 4 lamps in each case, of each type and size lamp used in each type luminaire. Deliver replacement stock as directed to Owner's storage space.

3.13 WARRANTY

A. All lighting and lighting controls equipment included in this section shall be fully tested and guaranteed for a period of five years after Owner's Representative written acceptance.

3.14 FINAL CLEANING

A. Prior to acceptance, damp clean diffusers, glassware, trim, reflectors, lamps, louvers, lens and similar objects of all luminaires. Remove all dirt, corrosion, foreign material, finger marks, and blemishes. Replace all burned out lamps and failed components.

END OF SECTION 265100

SECTION 265668 – EXTERIOR ATHLETIC LIGHTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Bid Alternate EC-03: Provide basis of design for field lighting at Gillette Road: Musco Lighting.

B. Provide complete lighting system which will meet the following criteria (36 inches above grade):

1. Baseball Field:
   a. Average maintained value of 50 foot-candles with a uniformity ratio of 2.0:1.0 using 30’ x 30’ grid spacing.
   b. Uplighting average maintained value of 5 foot-candles for the infield with a uniformity ratio of 4.0:1.0.
   c. Average 30 foot-candles in the adjacent batting cages with a uniformity ratio of 2.0:1.0 using 30’ x 30’ grid spacing.
   d. Average 15 foot-candles for the bleachers.
   e. Calculations shall include a 0.95 dirt/depreciation factor on all luminaires.
2. Multipurpose-Soccer Field:
   a. Average maintained value of 50 foot-candles with a uniformity ratio of 2.0:1.0 using 30’ x 30’ grid spacing.
   b. Uplighting average maintained value of 5 foot-candles with a uniformity ratio of 4.0:1.0. Calculations shall include a 0.95 dirt/depreciation factor on all luminaires.
3. Provide six new pole/fixture/foundation assemblies. Provide stamped professional engineer drawings for concrete pole and foundation detail.
4. Maximum light spill and glare shall not exceed 0.1 foot-candles at a perpendicular line at 150-feet away from the field boundary. The field boundary is based on a line straight between pole locations around the perimeter of the new field. This shall be measured at 5-feet above finished grade.
5. Alternate design for anchored pole base is acceptable with stamped professional engineer detail drawing.
6. Kilowatt consumption - The consumption of the entire system shall not exceed 85 kW.

C. Provide controls capable of controlling each of the following zones independently or all on together:

1. Multipurpose-Soccer Field w/ uplighting for balls in play

2. Baseball Field and Dugouts w/ uplighting for balls in play

D. Provide new poles and engineered foundations. Geotechnical test report is attached, refer to Appendix A.

E. Provide required pumping and storm water flow management for dewatering of foundation holes. Do not allow foundation water to spill onto adjacent track.

F. Provide lighting contactor enclosure at single location to control all new athletic light poles and accessory LED flood lights as shown on the drawings.

G. Individually controllable zones controlled locally at the Exterior Athletic Lighting Control Panel and be an Apple/Android App thru LTE 5G wireless communication.

H. Provide threaded conduit hubs on poles for accessory LED flood lights and public address speakers and cameras as shown on the drawings.

1.2 SUBMITTALS

A. Lighting fixture shop drawings shall include:

1. Standard Catalog "Cut" Sheet.
2. Scaled Photometric Drawing for all zones/sports modeled on separate sheets using computer-calculated predictions and should be taken in accordance with IESNA RP-6-15.
3. Total connect load (kW) per pole.
4. Lens/Louver Type.
5. Driver Type and Rating.
6. LED kelvin output and life-cycle data.
7. Control System wiring requirements
8. Maintenance Recommendations
9. Lighting Contactor Enclosure w/Contactors
10. Warranty Letter to Owner

B. Lay-down and mobilization plan shall include:

1. Method to secure light poles and assemblies prior to final installation to prevent roll-over. Contractor responsible to protect equipment from theft or vandalism.
2. Lay down plan prior to any light pole deliveries. Lay down plan shall include temporary storage locations, rigging methods, and delivery locations.
3. Indicated the above on an 11”x17” drawing and include with shop drawings.

1.3 QUALITY ASSURANCE

A. The manufacturer shall supply lighting equipment and computer generated point by point analysis to meet the following:

B. Performance Criteria

1. Light levels shall be derived from the equation of light loss factor (LLF) = ambient temperature factor (ATF) x voltage factor (VF) x driver factor (BF) x lamp tilt factor (LTF) x lamp lumen depreciation (LLD) x luminaire dirt depreciation (LDD) per I.E.S. RP-6-88 and shall be calculated as follows:

a. Initial Light Levels = ambient temperature factor (ATF) x voltage factor (VF) x driver factor (BF) x lamp tilt factor (LTF)
b. Target Light Levels = Initial light levels x lamp lumen depreciation (LLD) x luminaire dirt depreciation (LDD).

C. Spill/Glare Light

1. Maximum spill light values - Light levels shall not exceed the designated maximum foot-candle light spill values shown on contract drawings.
2. Calculations for and candela values 150-feet from edge of field boundary.

1.4 POINT BY POINT ANALYSIS

A. Computer Models - Test Stations

1. Submitted computer model shall depict the points covering the area inside the outer edge of the track court area locations shown outside the track where light spill is a concern on an equally spaced 30’ x 30’ grid.
2. Submitted model shall depicting target light levels @ .8 lumen loss factor.
3. Submitted computer models shall depict the calculated field readings taken with the meter positioned horizontal 36 inches above grade.
4. Include measurements at property lines.

1.5 INSPECTION AND VERIFICATION

A. Test and Measurement Procedures

1. All testing will be done with entire facility illuminated.
2. Horizontal footcandle readings shall be measured with the test cell positioned horizontal 36 inches above grade.
3. Maximum footcandles shall be measured with the test cell positioned 36 inches above grade and aimed at the brightest light source from the tested field.
4. Testing equipment for measurement of foot-candle levels shall be a Gossen Panalux Electronic 2 or an approved equal, calibrated and certified within the previous 12 months.

5. For final approval of the project the manufacturer shall provide a final report from the test results that shall provide the following items:

    a. Identification of number and location of the test stations, that shall agree in number and location with description provided in B.1.
    b. Actual horizontal foot-candle readings taken at each test station.
    c. Actual maximum foot-candle readings taken at each spill/glare test station.
    d. Number of hours of operation and number of system starts.

PART 2 - PRODUCTS

2.1 DESIGN MAKE: Musco Sports Lighting

2.2 ACCEPTABLE MANUFACTURER: Ephesus Lighting

2.3 LIGHT-STRUCTURE SYSTEM

A. General Description- The Light-Structure System shall consist of the listed equipment features below.

1. Pre-stressed centrifugally spun concrete base with upper tapered steel poles or anchor bolt steel pole.
2. Hot-dip galvanized steel shafts.
3. Hot-dip galvanized steel crossarms.
4. Fixture consisting of: lamp, lamp socket, reflector, lens, lamp cone, reinforcing retaining ring.
5. Complete UL listed assembly for luminaire over-current protection, crossarm brackets, pole, and luminaire pre-wiring harnesses.
6. Enclosure to consist of: NEMA 3R enclosure for remote mounted drivers or IP66 rated enclosure in integral to luminaires/heat sink assembly.
7. 480V disconnect switch at each pole/fixture remote driver assembly.
8. Thermal magnetic circuit breaker in NEMA 3R enclosure at each pole utilized as a local electrical disconnecting and overcurrent protection device.
9. All wiring from the load side of the breaker to the lamp socket.
10. Plug-in or landing lug connection devices for all electrical circuits on the pole.
11. Aiming method for alignment of the luminaires.
12. Method for re-alignment of the luminaire after movement. Luminaires shall be pre-aimed by the manufacturer prior to shipping. Luminaire shall include physical compass type bracket with set points of vertical and horizontal aiming. Fixture shall be capable of field adjustment by stainless steel screw hardware.

B. Pole Cap - A removable pole cap shall be provided to prevent moisture or foreign debris from entering the top of the pole. The pole cap shall be made from cast aluminum or iron. Aluminum pole caps shall have a supplemental coating of polyester or polyurethane powder coat paint, while cast iron pole caps shall be hot dip galvanized. The pole cap shall be secured to the pole top assembly with a single, 3/8" stainless steel bolt with a gasketed head to prevent moisture drainage on the inside of the pole top assembly . It shall further be secured by a stainless steel aircraft type cable to prevent it from being misplaced during installation and to ensure it does not fall during removal for repair or service work.

C. Materials and Coatings - All steel components shall be hot dip galvanized to the most current ASTM A-123 standards. High purity reflector grade aluminum shall be alzak finished. All other aluminum components shall be polyester or polyurethane powder coat painted and/or anodized to MIL-A-8625E specifications and coated with a clear thermoset polymer. All non-current carrying fasteners, hinges, and latches shall be stainless steel and cadmium plated or coated with a thermoset epoxy type organic coatings such as Empigard to prevent galvanic interaction.

D. Crossarm Welding - Crossarms for the luminaire assembly shall be welded to the pole section before galvanizing by American Welding Society certified welders. Any additional fasteners used for the attachment of accessories to the crossarm shall be stainless steel and cadmium plated or coated with Empigard or equivalent. All weld joints utilized will be pre-qualified per the American Welding Society or qualified by an AWS certified inspector or testing firm.

E. Structural Strength - The crossarm, reflector and their method of attachment shall be provided by the manufacturer such that it will structurally withstand winds of 125 mph winds with 1.3 gust factor without misalignment of any luminaire and without any damage to the crossarms or its components. Luminaires shall be attached to the crossarm by a minimum of two bolts, which fasteners shall be stainless steel and Empigard coated. There shall be no penetrations of the top or sides of the crossarm.

F. Grounding lug and lightning arrestor mounted to pole top.

2.4 LUMINAIRES

A. Factory Construction - The lamp and reflector mounting device shall be factory assembled to the crossarms and the crossarms shall be attached to a section of the pole by the manufacturer.

B. Single Photometric Unit - Each reflector shall be attached to the crossarm in such a way that its aiming position has been determined relative to all other fixtures on the pole so that in the factory all luminaires on the assembly are oriented to form a single photometric unit.

C. Individual Luminaire Performance

1. Multiple LEDs with custom acrylic prisms arranged inside the luminaire housing to achieve a NEMA 2, 3, or 5 or custom reflector pattern.
2. Max. Wattage: 1500W

3. Min. Efficacy: 120 Lumens/Watt
4. Driver Input Voltage: 480VAC
5. Power Factor: >.95 <10% THD
6. CRI: >70
7. CCT: 5700K CCT
8. Control: Wired
9. Operating Temp Range: -20ºC to 50ºC
10. EPA per. individual luminaire: 3.0 to 4.0 feet²
11. IP Rating: IP66

D. Reflector and Lamp Supports - The reflector shall be fastened to the lamp cone utilizing stainless steel screws.

E. Each luminaire is pre-aimed, tilt and azimuth set points visible on engraved compass integral to each luminaire. Field adjustable via/ stainless steel screw hardware. Luminaires are factory-aimed to two-tenths degree of accuracy.

F. A cast aluminum custom engineered heat sink shall be integral to the luminaire housing.

G. Provide factory glare reduction hood on all fixtures. Hood shall contribute to optical efficiency of fixture.

H. Provide surge arrestor for lightning arrestor with equipment connection.

I. Lens - A removable lens of impact and thermal resistant glass with silicone gasket shall be centered in a stainless steel lens rim and attached to the reflector with a minimum of four hardened stainless steel clamps. The lens shall further be secured to the reflector with a hinged cable or chain to prevent it from falling after removal during re-lamping or servicing.

2.5 WIRE HARNESS

A. Strain Relief - The wiring harness shall be supported at the top of the pole by a stainless steel wire mesh grip matched to the size of the harness. There shall be not more than 13 conductors supported by a single wire mesh grip. If harness is longer than 65’ an interim wire mesh grip support shall be located approximately half way down the pole.

B. Strain Relief Slippage - The wire mesh grip shall be secured to the harness with a cable tie at the bottom of the grip to avoid slipping or loosening.

C. Pole Attachment - The wire mesh grip shall be mechanically attached to the pole to an enclosed mounting loop so that it cannot accidentally be removed in any direction.

D. Spiral Winding - The harness being supported by the wire mesh grip shall consist of multiple 14 gauge THHN conductors and shall be continuously spiral wound and bound with mylar wrap to prevent slippage of individual conductors within the wiring harness.

E. Abrasion Protection Sleeving - The wire harness shall be completely encased in flexible abrasion resistant sleeving to alleviate wear on the insulation of the conductors caused by abrading the interior of the pole. The wire harness sleeving shall begin no more than 32 inches from the top of the wire harness and end no more than 5 inches from the bottom of the wire harness. If additional wire mesh grips are provided, the sleeving shall begin no more than 4 inches above and below the grip.

F. Labeling - All wiring harness conductors shall be color-coded and clearly labeled.

G. Plug-Ins - Each end of the wire harness shall be terminated into a plug-in with conductors sequenced consistent with the pattern of the wiring schematic provided by the manufacturer.

H. Testing - All conductors and plug-ins shall be tested for resistance under load, for continuity, schematic sequence, and for insulation integrity. Manufacturer shall ship with the wire harness a copy of the test results.

2.6 POLE MOUNTED DISCONNECT COMPARTMENT

A. Shall be an IP66 or NEMA 3R rated gasketed enclosure to house the drivers where mounted remotely, capacitors, fuses, thermal magnetic circuit breaker, and distribution lugs.

B. Driver Type - There shall be individual driver for each luminaire. The driver shall be a lead peak auto-regulating driver and be available for use with any standard supply voltage. The assembly design shall be adaptable to various standard manufactured driver and must retain UL listing. Electronic wirelessly or wired controlled step dimming LED type driver with the same warranty as the luminaire package shall also be acceptable.

C. Shall be constructed out of .080” thick 5052-H32 aluminum for high corrosion resistance and thermal conduction. Optional: Galvanized steel.

D. Shall be divided into two compartments. The upper compartment shall house the drivers, capacitors, and fuses. The lower compartment shall provide for the thermal magnetic circuit breaker, distribution lugs, and connection of all circuits coming into and out of the enclosure.

E. Stainless Steel - All latches, hinges, and non-current carrying fasteners, either outside or inside the enclosure, shall be stainless steel of at least an 18-8 standard. All stainless steel shall be passivated and plated with .0002” thick cadmium to prevent galvanic interaction and to maintain electrical contact for grounding purposes.

F. Hinged Door Access - The access door to the enclosure shall be attached by a full-length stainless steel or powder coated aluminum hinge and shall be secured when closed by lockable stainless steel latches.

G. Pole Attachment – The enclosure shall attach to the pole by means of a device which is sufficient to align the enclosure and support its weight. There shall be a sealed joint with a non-threaded connection to provide wiring access from the pole to the enclosure for both the primary and secondary circuits. The connection shall be gasketed for water-tight protection. All wire passages shall be protected to prevent wire abrasion or damage.

H. Disconnecting Device - There shall be provided within the enclosure a UL listed 3-Phase thermal magnetic circuit breaker ir IEC disconnect utilized as a local electrical disconnecting device such that electrical power to all equipment on the pole served by the feeder circuit shall be disengaged by the operation of one switch.

I. Distribution Terminal Blocks - There shall be provided by the manufacturer a set of distribution terminal blocks which shall be factory wired from the breaker to the blocks. These blocks shall provide for termination of all driver connection wiring.

J. Fusing - There shall be provided an individual fuse in a supported fuse block for each driver conductor, except neutral conductors which shall not be fused or switched.

K. Plug-In - All lamp supply circuits in the enclosure shall be color-coded and labeled and shall terminate into a UL recognized plug-in device located in the lower compartment of the ECE in a manner suitable for plug-in to the wiring harness.

L. Wire Harness Connection - The wiring harness circuits from the lamps shall be attached to the enclosure circuits by UL recognized plug-in connectors.

M. Grounding - There shall be ground wire rigidly fastened to the enclosure for attachment to the pole ground lug.

N. Drawings Attached - The manufacturer shall provide an electrical schematic of the remote driver compartment circuits, which schematic shall be of a durable material and affixed to the inside of the ECE door for use by maintenance personnel.

O. Location - The enclosure shall be attached to the pole with the lower end approximately 10’ above grade at the pole foundation.

P. UL Listing - The enclosure shall be listed by UL both for use with 90 degrees C rated supply conductors and as suitable for use in wet locations.

2.7 MANUFACTURER ASSEMBLED LIGHTING CONTROL PANEL AND CONTROLS

A. Factory-assembled Lighting Contactor Cabinet - The Lighting Contactor Cabinet shall be factory-assembled and wired by a UL Listed panel builder. The LCP shall arrive job site ready for structural attachment to an existing wall, switchgear rack or free standing enclosure. The cabinet shall structurally consist of the following:

1. Enclosure Cabinet - To provide protection against corrosion, the contactor cabinet shall be a NEMA 4 rated gasketed enclosure fabricated from 5052 H32 quality aluminum that is at least .10 thick. The enclosure shall be further coated with a polyurethane powder coat paint after fabrication to provide protection from oxidation of the aluminum.

2. Cabinet Door - For safety of personnel and equipment, door shall be electrically bonded to the cabinet enclosure. Cabinet door shall utilize a lockable, 3 point latching assembly that provides a NEMA 4 rated seal.
3. Subpanel - Built-to-order subpanel shall be fabricated from 5052 H32 quality aluminum that is at least .10 thick. The panel shall be pre-punched to specific contactor configurations and further coated with a polyurethane powder coat paint. Panel shall be electrically bonded to the exterior enclosure.
4. Cabinet Labeling - For easy identification and maintenance, each enclosure shall contain typical control and power wiring schematics as well as project specific control schematics. For easy installation, each cabinet shall be labeled to match the field diagrams, pole identification, breaker schedule, and other applicable components.

B. Control Wire Terminations - To allow for fast, labor saving installation, the control wire terminations shall be ready to accept plug-in connection from a remote equipment controller and additional contactor cabinets. The control wire terminations shall include UL Listed terminal blocks mounted on a DIN rail and a 600 volt, 16 amp, IEC type fuse holder fused at 10 amps. All control wiring internal to the cabinet shall be type MTW (Machine Tool Wire) rated for 105 degrees C.

C. Diagnostic Equipment - To allow for future diagnostic features, the subpanel shall be pre-punched for mounting the diagnostic devices.

D. Contactor Modules - For power switching the contactor modules shall be custom configured for 30, 60 and 100 amps. Provide contactors as shown on the drawings.

1. Contactors - Contactors shall be UL Listed for lighting applications. They shall be rated at full capacity, be electrically held, utilize a 120 volt coil and be rated for operation in an ambient temperature range of -40 degrees C to +70 degrees C.
2. Terminal Blocks - Terminal blocks shall be UL Listed. 30 and 60 amp modules shall be sized to handle 2/0-14 gauge wire. 100 amp modules shall be sized for 350 mcm-6 gauge wire. If required, neutral blocks shall be provided next to the terminal blocks.

E. Control Panel Mounted Manual Off-On-Auto Selector Switches - For control panel manual control, three position selector switches (Off-On-Auto) shall be factory-mounted through the Lighting Contactor Panel door, or housed in a separate NEMA 4 rated enclosure. The switches shall be keyed and maintain position, with make-before-break contacts. A legend plate shall clearly identify zone and position of each switch. Switches shall be factory-wired to the control terminal blocks. Provide switches for controllability to allow each pole to be turned on/off separately.

F. Remote Manual Off-On-Auto Selector Switches - For remote on-site manual control, two position selector switches (Off-On) shall be factory-mounted in a separate 12” x 12” NEMA 1 rated enclosure. It will be located inside the exterior Press-Box building. The switches shall be keyed and maintain position, with make-before-break contacts. A legend plate shall clearly identify zone and position of each switch. Provide switches for controllability to allow each pole to be turned on/off separately. Provide switches for controllability to allow the LED accessory flood lights to be turned on separately.

G. Provide provisions in the Lighting Control Panel to allow a single external relay from the Building Automation System to remotely turn on/off all lighting contactors at the same time.

H. Ground Bar - For safety of equipment and personnel, a ground bar that accepts up to 15 #12 to #4 gauge wires shall be provided.

I. Warranty - The Lighting Contactor Cabinet shall be covered under the standard warranty for the accompanying product.

J. 5G LTE based controller with required antennas to communicate to all luminaires and poles.

K. Provide with required wireless control application installation on up to (4) owner designated smart phones (Apple IOS and Android compatible) for remote access to turn on the lights to each zone.

2.8 POLE STRUCTURE

A. Safety Factors - The structural design of the poles must be demonstrated to be based on the NYS 2020 Building Code and Chapters 26 to 30 of ASCE 7, 115mph.

B. Support Structure Wind Load Strength: Poles and other support structures, brackets, arms, bases, anchorages and foundations shall be determined based on the current edition of the International Building Code, wind speed of 115 mph, exposure category C and an importance factor of 1.0. Luminaire, visor, and cross arm shall withstand 150 mph winds and maintain luminaire aiming alignment.

C. Height and EPA - The pole shall be designed to provide a mounting height above the surface at its foundation of 80’ and to be of sufficient strength to support the effective projected area (EPA) of the pole and all of the attached devices including, as applicable, light fixtures, crossarms, mounting brackets, driver boxes, and any other devices which are to be attached to the pole.

D. Pole Material - The pole shaft shall be high strength low alloy tapered tubular steel that is equal to current ASTM-A595 standards, with galvanized coating inside and out. All connections of pole sections shall be by slip fitting the top section over the lower section by a length of at least 1.5 times the diameters.

E. Resistance to Corrosion - Steel components of the pole shall be hot dip galvanized to current ASTM A-123 standards. Steel portions of the pole shall be constructed such that all segments of the pole can be readily heated to like temperatures in commercially available galvanizing methods.

F. To avoid problems of galvanize adherence to differing steel alloys, all steel components used for the pole must be of the same type steel.

G. All exposed steel components of the pole shall be at least 18" above the surface of the ground to avoid exposure of the steel to the heavily moisture and oxygen laden air, both above and below the surface. There shall be a cap to cover the top of the pole so that rain will not enter the interior of the pole.

2.9 FOUNDATION

A. Safety Factor - The foundation must be designed based on NYS 2020 Building Code and Chapters 26 to 30 of ASCE 7, 115mph, Exposure C design for foundations.

B. Foundation Strength - Any concrete portions of the pole in which steel components that provide tension strength are contained, shall be allowed to harden for a minimum of 28 days before stress loads of pole attachment are applied.

C. Provide steel caisson where required to hold back collapse of augured hole and concrete backfill as recommend by the foundation design engineer.

D. Concrete material for concrete pier foundations - The foundation of the pole shall be constructed of not less than 9,500 psi pre-stressed c centrifugally cast concrete such that the steel reinforcement within the concrete shall be protected from slippage and exposure to oxidation through voids in the concrete or exposure of the steel through porous concrete material.

E. Providing engineered foundation embedment design by a registered engineer in the State of New York for soils other than specified soil conditions. Design shall include depth, concrete infill, pole structure embedment, and alternate anchoring, along with wind load verification.

F. Include additional materials required to achieve alternate foundation.

G. Include excavation and removal of materials other than normal soils, such as rock, caliche, etc.

PART 3 – EXECUTION

3.1 SAFETY - SPECIAL CONDITIONS

A. UL Listing - There shall be provided a UL listing for all electrical components from its connection to the feeder conductors, to its completion at the lamp socket including all connections. This listing shall be based upon UL testing and evaluation of the compatibility of the enclosures and the components for use in combination in this application in addition to the individual components being UL listed or recognized.

B. UL Test Report - Bidder shall supply in advance of bid a copy of the complete Underwriters Laboratory report covering the entire luminaire assembly being bid for the owner's review and retention. Partial UL files will not be accepted per the requirements of UL. In addition, bidder must supply proof of most recent Underwriters Laboratory inspection process.

C. Codes - Sports Lighting Structure shall meet National Electrical code.

3.2 WARRANTY

A. Assurance - Manufacturer will provide services including all materials and labor to maintain operation of all luminaires and control components for ten years or 5,000 hours according to original design criteria, including alignment of luminaires on the poletop luminaire assembly.

B. Conditions are as follows:

1. Lamps will be group replaced at such time the lamps exceed their useful life, which is 50,000 hours for the LED luminaires. Individual lamp outages will be repaired when any one of these events occur:

    a. When more than 5% of the lamps are out on any one field.
    b. When lamp outages materially effect the usage of the field by more than 5% of original design criteria.

2. Regular Monitoring - Manufacturer shall provide annual inspection and monitoring every September of the lighting equipment and overall system.
3. Preventative and Spot Maintenance - Manufacturer shall provide preventative and spot maintenance as needed to maintain operation of the Exterior Athletic lighting equipment and system.

C. Limitations - Maintenance, repair or replacement necessitated by loss or damage resulting from any external causes such as:

1. Vandalism
2. Major storms and lightning
3. Unauthorized repairs
4. Failure of owner’s electrical service

D. Service Contact - Manufacturer shall provide a toll-free number to a full-time service department which shall be staffed by qualified repair personnel.

E. Assurance Guarantee - Manufacturer shall be responsible for and provide the warranty services. To assure full compliance with this warranty, manufacturer shall provide the Owner with a signed Certificate of Insurance which guarantees the commitment for the entire ten years as to each of the above terms. The insurance policy shall be fully funded on an actuarially sound basis and underwritten by a top-rated insurance company.

F. Factory warranty shall include labor and materials to cover all the Exterior Athletic Lighting equipment and system components completely including but not limited to: controls, crossarms, poles, foundations, luminaires, wiring harnesses, and drivers.

3.3 INSTALLATION

A. Weight and Size - To permit ease of handling of material at the job site and to avoid

damage to the existing facility, no single component of the pole shall be in excess of 5,300 lbs., nor be greater than 50’ in length.

B. Backfill - The pole base shall be installed in an excavation as prescribed by the UBC standards for foundation design. Concrete backfill is required.

C. Assembly - The pole base shall be separate from the pole such that the base may be installed, properly plumbed, and enlarged as to the bearing surface by concrete backfill allowing for inspection prior to the attachment of the steel pole.

D. Electrical Wiring - The pole and the luminaries shall be designed such that all wiring remains underground before entering the base of the pole and that no wiring shall be exposed to sun or weather as it transitions through the pole and to the driver and on to each lamp. There shall be provided a non-threaded hot-dip galvanized steel enclosed raceway for transition of the pole feeder conductors from the trench to the ECE.

E. Field Connections - All field electrical connections on the pole shall be achieved by UL listed plug-in or lug method of attachment from the load side of the breaker/disconnect to the lamp socket. The feeder and grounding conductors from the service entrance to the pole shall be connected at the pole by landing lugs.

END OF SECTION 265668

Appendix A - Site Geotechnical Survey for Pole and Foundation Design Reference

WHITESTONE

500 CANAL VIEW BOULEVARD
SUITE 700
ROCHESTER, NY 14623
585.252.6879
whitestoneassoc.com

May 30, 2024

via email

NORTH SYRACUSE CENTRAL SCHOOL DISTRICT
c/o APPEL OSBORNE LANDSCAPE ARCHITECTURE
102 West Division Street
Suite 100
Syracuse, New York 13204

Attention: Stacey Albunio, RLA
Project Manager

Regarding: LIMITED GEOTECHNICAL INVESTIGATION
PROPOSED GILLETTE ROAD MIDDLE SCHOOL IMPROVEMENTS
6150 SOUTH BAY ROAD
SECTION 53, BLOCK 2, LOT 6.1
CICERO, ONONDAGA COUNTY, NEW YORK
WHITESTONE PROJECT NO.: GR2421693.Y00

Dear Ms. Albunio:

Whitestone Associates Engineering & Geology NY, PLLC (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The results of the investigation and recommendations presented below are based on the soil conditions disclosed from a limited number of explorations conducted during Whitestone's field investigation. The purpose of the investigation was to assess subsurface conditions within the proposed improvement areas accessible to track-mounted drilling equipment. Recommendations for support of the proposed structures and pavements, and anticipated earthwork requirements are included herein.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The 37-acre property, located at 6150 South Bay Road in Cicero, Onondaga County, New York, is identified further as Section 53, Block 2, Lot 6.1. The property is developed with the Gillette Road Middle School, which has extensive playing fields.

1.2 Site Geology

According to the University of the State of New York, The State Education Department *Surficial Geologic Map of New York, Finger Lakes Sheet* (1986), the site is underlain by glacial till. The mapped boundary with a lacustrine silt and clay deposit is at the northern edge of the site. The lacustrine silt and clay deposit was generally encountered in the borings. The University of the State of New York, The State Education Department *Geologic Map of New York, Finger Lakes Sheet* (1970) indicates that the subject site is underlain by Upper Silurian-age Ilion Shale, consisting of black shale with incidental dolostone, part of the Lockport Group. Bedrock was encountered close to the ground surface in some borings. The site is not within an area mapped as karst.

1.3 Proposed Construction

Based on an undated *Geotech Test Locations Map* provided by Appel Osborne Landscape Architecture of Syracuse, New York, the proposed improvements include development of a new multipurpose synthetic turf field, new field lighting, reconstruction of existing parking areas, and stormwater management area enhancements. Site grades are anticipated to remain relatively unchanged. No new retaining walls are shown on the *Geotech Test Locations Map*.

Detailed structural information was not available at the time of this report. Maximum moment, shear, and axial compression at the base of the poles are anticipated to be less than 1,000 foot-kips, 2.0 kips, and 2.5 kips, respectively.

2.0 FIELD EXPLORATION & TESTING

2.1 Field Exploration

Field exploration at the project site consisted of advancing eight borings (identified as B-1 through B-8) within the proposed improvements area. The borings subsequently were backfilled to the surface with excavated soils from the investigation and patched with "cold patch" asphalt, where appropriate. The locations of the borings are shown on the accompanying *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The asphaltic concrete pavement was cored at 11 locations. The cores indicated that the thickness of the existing asphaltic concrete ranged from approximately one inch to seven inches. The asphaltic concrete core photographs are included in Appendix B. The asphaltic concrete is underlain by approximately six inches to 11 inches (typically six inches to seven inches) of granular subbase, which is generally crushed stone, except for one location where the asphalt was underlain by sandy silt with gravel. The results of the pavement explorations are tabulated below.

SUMMARY OF PAVEMENT SECTION MEASUREMENTS				
Exploration	**Asphaltic Concrete Thickness (in)**	**Asphalt Core Condition**	**Granular Subbase Thickness (in)**	**Granular Subbase Type**
C-1	4.0	Intact	8.0	Crushed stone
C-2	3.3	Intact	7.0	Sandy silt with gravel
C-3	7.0	Intact	7.0	Crushed stone
C-4	2.5	Intact	11.0	Crushed stone
C-5	1.5	Intact	6.0	Crushed stone
C-6	3.5	Intact	6.0	Crushed stone
C-7	1.0	Disintegrated	6.0	Crushed stone
C-8	1.0	Disintegrated	6.5	Crushed stone
C-9	1.0	Intact	6.0	Crushed stone
B-5	1.5	Partially disintegrated	7.0	Crushed stone
B-6	6.3	Intact	8.0	Crushed stone

Dynamic cone penetrometer (DCP) testing was conducted at three locations using a Vertek Smart DCP. The results of the testing are summarized below. Full results are included in Appendix C.

SUMMARY OF DYNAMIC CONE PENETROMETER TESTING		
Location	**Depth Interval Tested (ft)**	**Minimum Inferred CBR (%)**
C-1	0.0 - 1.7	4.0
C-5	0.1 - 1.8	5.8
C-8	0.1 - 0.3	10.0

The subsurface tests were conducted in the presence of a Whitestone engineer, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Infiltration Testing

Soil conditions at the locations of the infiltration testing were evaluated by advancing borings B-1 through B-4, B-7, and B-8. Infiltration tests I-1 through I-5 were then conducted in general accordance with the procedures in the *NYS Stormwater Management Design Manual* at the locations shown on the *Boring Location Plan*. PVC casing, four inches in diameter, was installed to depths of two fbgs to 5.7. The soil in infiltration tests I-1, I-2, and I-3 was pre-soaked for approximately one hour. The soil in infiltration tests I-4 and I-5 was pre-soaked for overnight. Following testing, the casings were removed. The results are tabulated below.

SUMMARY OF INFILTRATION TESTING				
Location	**Approximate Ground Elevation (ft NAVD)**	**Test Depth (fbgs)**	**Approximate Test Elevation (ft NAVD)**	**Infiltration Rate (in/hr)**
I-1 [1]	410	2.0	408.0	0.0
I-2 [1]	410	2.5	407.5	0.0
I-3 [1]	410	3.0	407.0	0.0
I-4 (B-8)	400	4.5	395.5	0.0
I-5 (B-7)	395	5.7	389.3	0.0

Note [1]: Borings B-1 through B-4 advanced in the general area of infiltration tests I-1, I-2, and I-3.

Typically, a Factor of Safety (FoS) is applied to measured infiltration rates to account for siltation and consolidation of soil below the systems over time. Safety factors used should consider how critical the systems are to the development and the available storage. If the system is critical or storage limited, a higher FoS should be applied. Infiltration rates are variable and dependent on test depth and stratification.

2.3 Laboratory Testing

Representative samples of the site soils were subjected to laboratory testing that included moisture content determinations (ASTM D2216), in order to conduct supplementary engineering soil classifications in general accordance with ASTM D2487. The soil strata tested were classified by the Unified Soil Classification System (USCS). Moisture contents are shown on the *Records of Subsurface Exploration.*

3.0 SUBSURFACE CONDITIONS

The subsurface soil conditions encountered within the subsurface tests conducted by Whitestone consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover Materials: Borings B-1 through B-4 encountered six inches to 12 inches of topsoil at the ground surface. Borings B-5 through B-8 encountered one inch to 6.3 inches of asphaltic concrete at the ground surface with six inches to eight inches of granular subbase. At the coring locations, the asphaltic concrete thickness ranged from one inch to seven inches.

Existing Fill: Beneath the surface cover materials, borings B-3 through B-7 encountered existing fill, consisting of reddish-brown to black, loose to dense, sandy silt with gravel to sandy silt. SPT N-values within the existing fill were variable, ranging from six blows per foot (bpf) to 37 bpf. Where penetrated, the existing fill extended to depths of approximately two feet below ground surface (fbgs) to five fbgs. Boring B-6 terminated in the existing fill at a depth of four fbgs.

Lacustrine Deposit: Beneath the existing fill or surface cover materials, borings B-1, B-3, B-4, B-7, and B-8 encountered a lacustrine deposit, consisting of reddish-brown to brown to gray-brown, loose to medium dense, sandy silt to silt (USCS: ML) to medium stiff (occasionally very stiff), silty clay (USCS: CL) to very loose, silty sand (USCS: SM). SPT N-values within the lacustrine deposit were variable, ranging from two bpf to 28 bpf. Borings B-7 and B-8 terminated in this stratum at a depth of nine fbgs.

Glacial Till: Beneath the lacustrine deposit, boring B-3 encountered glacial till, consisting of brown to gray, medium dense to very dense), sandy silt with gravel (USCS: ML). An SPT N-value within the glacial till was 27 bpf. Boring B-3 terminated in the glacial till at a depth of 23.9 fbgs.

Bedrock: Borings B-1, B-2, B-4, and B-5 encountered weathered bedrock at depths of 0.5 fbgs to four fbgs. Borings B-1, B-4, and B-5 terminated in the weathered bedrock at depths of 4.2 fbgs to 10.3 fbgs. Bedrock, cored in boring B-2 from 14.5 fbgs to 19.5 fbgs, consists of reddish-brown to green, weathered, very fine grained, thinly bedded, soft to medium hard, shale. Recovery was only 52 percent. The RQD value was zero percent, indicating “very poor” rock quality. A photograph of the rock core is attached. RQD values typically increase with depth. Weathering generally decreases with depth.

Groundwater: Groundwater was encountered in boring B-3 during the investigation at a depth of 13.5 fbgs at completion of drilling. However, shallower perched water should be expected during construction above impermeable layers, such as at the interface between existing fill and natural site soils, and at the bedrock surface. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

4.0 CONCLUSIONS & RECOMMENDATIONS

Contingent upon construction phase evaluation, Whitestone recommends supporting the light poles on shallow drilled pier foundations extending through any existing fill into the bedrock or lacustrine deposit. Additionally, the site conditions support the use of typical pavement sections using standard New York State Department of Transportation (NYSDOT) specified materials.

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered within the limited exploration conducted. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, Whitestone should be consulted, so that the recommendations of this report can be reviewed.

4.1 Site Preparation & Earthwork

Surface Cover Stripping: Prior to stripping operations, utilities should be identified and secured. Asphaltic concrete, topsoil, organic subsoil, vegetation, and other organic matter should also be removed from within and at least five feet beyond the limits of the proposed improvements, as well as any other area that will require controlled structural fill placement. The contractor should be required to conduct earthwork in accordance with the recommendations in this report, including backfilling any excavation, etc. with structural fill. Fill or backfill should be placed as structural fill in accordance with the recommendations of this report.

Excavation Difficulties: Bedrock was encountered at depths of 0.5 fbgs to four fbgs. However, the bedrock surface typically undulates and may be encountered at shallower depths than in the borings. The upper few feet of fractured/weathered bedrock can likely be broken up with the "hoe-ram" and removed with a large excavator. However, removal of harder bedrock below the upper few feet of weathered and fractured rock will require significant effort.

Surface Preparation/Proofrolling: Prior to placing any fill to raise or restore grades to the desired subgrade elevations, if required, the existing exposed soils should be compacted to a firm and unyielding surface with several passes in two perpendicular directions of a minimum 10-ton vibratory compactor. The surface should then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be conducted after a suitable period of dry weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be attempted in the winter or when temperatures are below freezing, Whitestone should be contracted for alternative surface preparation recommendations. Fill and backfill should be placed and compacted in accordance with Section 4.2.

Weather Performance Criteria: The site soils are generally moisture sensitive. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 4.2 of this report may be required prior to resuming work on disturbed subgrade soils.

Subgrade Protection and Inspection: Every effort should be made to reduce disturbance of the on-site soils by construction traffic and surface runoff. The on-site materials may deteriorate when subjected to repeated construction traffic and/or inclement weather, which would require removal and replacement. The contractor should be responsible for protection of subgrades and minimization of exposure of the site

materials to precipitation by covering stockpiles and subgrades with plastic and preventing ponding of water by sealing subgrades before precipitation events and grading the site to allow proper drainage of surface water. All rutting from construction equipment should be removed prior to any forecasted or actual precipitation. Whitestone should be retained to observe soil conditions during construction and review the suitability of prepared foundation subgrades for support of design loads.

Groundwater Control: Groundwater was encountered in one boring at a depth of 13.5 fbgs. However, shallow perched water may be encountered during construction above relatively impermeable layers, such as at the interface between existing fill and natural site soils, and at the bedrock surface. As such, construction phase dewatering may consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that construction phase dewatering could include installing temporary sump pits and filtered pumps within trenches and excavations. Whitestone recommends that foundation construction occur during periods of relatively dry weather. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of foundation areas to precipitation.

4.2 Structural Fill & Backfill

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well-graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Synthetic Turf Support: The manufacturer of the synthetic turf selected for installation will have specific requirements for subgrade preparation and granular base placement. Whitestone anticipates that a geotextile separation fabric (Mirafi 140N, or similar) will be placed over compacted subgrade and that up to 12 inches of NYSDOT *733-04 Type 2 Subbase*, or similar, will be placed over the geotextile, probably with a thin leveling layer of crusher fines over the granular base, before laying the synthetic turf.

Soil Reuse: The fine-grained lacustrine soils encountered throughout the site are marginally acceptable for reuse as structural fill and/or backfill because of their difficult workability. Reuse of the fine-grained soils will likely require extensive moisture conditioning and/or drying to facilitate their reuse, workability, and compaction in fill areas. Similarly, the existing fill materials generally also have a relatively high fines content and will require drying and/or mixing with more granular material before reuse. In addition, reuse of the existing fill with a higher fines content should not be attempted during inclement weather or in damp conditions. Immediate re-use of some of the existing fill should not be expected. Reuse of the site soils will be contingent on careful review in the field by the owner's geotechnical engineer.

Stringent quality control and inspection by the geotechnical engineer will be required for suitable portions of the on-site soils to be reused as structural fill and backfill, and to check that the soils are properly placed and compacted within two percent of their optimum moisture content.

Immediate re-use of on-site soils for structural fill or backfill should not be anticipated as the majority of the site natural soils are moisture sensitive. On-site natural materials that are or become wet will require extensive handling, such as discing and aerating, which may not be practical during wet seasons or where site area is limited. In order to attempt the re-use of on-site soil, the contractor should cover stockpiled soils, seal subgrades each day with a smooth drum roller, and provide proper surface drainage during forecasted wet weather. Alternatively, imported fill materials may be required to expedite earthwork operations. The stripped surface cover materials should not be used as structural fill or backfill.

Submerged Fill: In the wet (flooding, perched water, or groundwater), consideration should be given to placing an open-graded, 0.75-inch crushed stone to provide a working mat, expedite dewatering efforts and enable subsequent placement of structural fill or backfill in the dry. Prior to placing submerged fill materials, free water and disturbed materials should be removed to the extent recommended by the geotechnical engineer. A fines barrier geotextile, such as *Mirafi 140N* or equivalent, should be placed at the base and sides of the overexcavation to separate the crushed stone from underlying and adjacent soils. The fabric also should be placed on top of the crushed stone prior to subsequent fill placement, if fill soils with a substantial amount of fines are to be used to restore grade.

Compaction and Placement Requirements: Fill and backfill should be placed in loose lifts no more than 12 inches thick when compacted with a vibratory roller compactor weighing at least one ton, and eight inches when compacted with a plate compactor. Fill and backfill should be compacted to 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

4.3 Foundation Design Criteria

Light Pole Foundations: Light poles may be supported on shallow drilled pier foundations, typically a concrete filled "Sonotube" in an augered hole or a precast concrete cylindrical base placed in the augered hole. Subsurface conditions vary significantly across the site, such that the piers could be wholly within bedrock or the lacustrine deposit, materials with substantially different load carrying capacities. The design parameters presented below are for the lacustrine deposit and represent the lower bound case. The light pole manufacturer will provide the design based on the actual loading.

Whitestone recommends that the piers have a minimum diameter of 24 inches, and a minimum embedment of seven feet below adjacent finished grade. (Piers wholly in bedrock should have a minimum embedment of five feet below adjacent finished grade.) The piers may be designed on the basis of a maximum allowable bearing pressure of 4,000 psf. Shaft (skin) friction should be ignored above a depth of 3.5 fbgs. Below a depth of 3.5 fbgs, maximum allowable shaft friction of 100 pounds per square foot (psf) and 75 psf may be used for compression and tension loading, respectively. An allowable lateral bearing pressure for the lacustrine deposit of 100 pounds per square foot per foot (psf/ft) below grade may be used for support of lateral loads, however, the upper 12 inches of the pier should be ignored in the calculation of lateral resistance. Whitestone should review the design of the piers.

Groundwater was encountered in the one boring at a depth that is likely below the bottom of the drilled piers. However, shallower perched water may infiltrate into the piers. Pumping or bailing may be required to establish a dry hole for concrete placement.

Once the design embedment is reached, loose soil should be removed. The typically narrow annular space between the "Sonotube" or cylindrical base, and the sides of the augered hole should be filled with flowable fill, especially where lateral resistance is being relied upon.

Pier construction should be monitored to confirm that the pier is excavated to the appropriate depth, the hole is dry, and any debris and/or loose soil/rock are removed from the bottom of the excavation. For poured concrete piers, the reinforcement should be aligned correctly with adequate cover, and concrete should be directed down the center of the pier without segregating from striking the reinforcing steel.

Seismic Site Class: Based on a review of the subsurface conditions relevant to the *New York State Building Code*, the subject site has been assigned a Site Class D. The site soils are not susceptible to earthquake induced liquefaction.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils at the pier bottoms be reviewed by a geotechnical engineer immediately prior to placing concrete. In the event that areas of unsuitable materials are encountered, additional excavation and longer piers may be necessary.

Frost Coverage: Foundations subject to frost action should be placed at least 48 inches below adjacent exterior grades, or the depth required by local building codes, to provide protection from frost penetration.

Settlement: Whitestone estimates post construction settlements of proposed foundations of less than one inch, if the recommendations outlined in this report are properly implemented.

4.5 Pavement Design Criteria

Whitestone anticipates that the properly inspected and approved existing fill (improved with thorough surface compaction) or lacustrine deposit, and/or compacted structural fill/ backfill placed to raise or restore design elevations will be suitable for support of the proposed new pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with the recommendations of this report during favorable weather conditions.

A California Bearing Ratio value of 5.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 30,000 ESALs and 75,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

Pavement components should meet material specifications from NYSDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	**Material**	**Standard-Duty Thickness (inches)**	**Heavy-Duty Thickness (inches)**
Asphalt Top Course	NYSDOT 12.5 mm F3 Top Course HMA, 70 Series Compaction (Superpave); PG64S-22	1.5	1.5
Asphalt Binder Course	NYSDOT 19 mm F9 Binder Course HMA, 70 Series Compaction (Superpave); PG64S-22	2.5	3.5
Granular Subbase	NYSDOT 733-04 Type 2 Subbase	12.0	12.0

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at ingress/egress locations. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (inches)**
Surface	4,000 psi air-entrained concrete	6.0 [1]
Granular Subbase	NYSDOT 733-04 Type 2 Subbase	12.0

Note [1]: The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of six-inch by six-inch W5.4/W5.4 welded wire fabric (ASTM A185).

The site soils and shallow weathered bedrock have poor drainage characteristics. Whitestone recommends installing interceptor drains extending from catch basin structures to improve drainage within these areas. Interceptor drains typically consist of top perforated polyvinyl chloride (PVC) piping within a 12-inch by 12-inch, clean 0.75-inch crushed stone layer surrounded by a fines separation fabric. A woven fabric, such as long term clog resistant *Mirafi FW700*, or approved equivalent, is recommended. Interceptor drains should be designed to pitch towards and discharge into the stormwater drainage system. The pipes should have a minimum slope of 0.5 percent.

The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with the recommendations of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control, a network of interceptor drains and an edge drain where the pavement abuts higher ground.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that NYSDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

Following paving, as with all asphaltic concrete pavement, a maintenance program should be implemented for the design life of the new pavement. The program should include, when appropriate, sealing cracks with hot rubberized sealant and applying a polymer-modified asphalt emulsion seal coat over the entire pavement. Maintenance should be conducted bi-annually, prior to freezing weather conditions and following periods of increased freeze-thaw cycles, typically in the spring. Detailed records of the sealing and repairs that are conducted should be kept. The geotechnical engineer should be an active participant in the program. Pavement cracks greater than ¼ inch in width should be cleaned of weeds, etc. and air-jetted to remove trapped materials. The resultant void should be filled with hot rubberized sealant.

4.6 Retaining Walls/Lateral Earth Pressures

The following parameters may be used for design of any retaining walls, below-grade walls, and other structures reliant on granular materials to provide adequate drainage. However, the parameters are not directly applicable to the design of mechanically stabilized earth (MSE) retaining walls, which require proprietary design methods for the selected earth retention system.

Retaining/below-grade walls should be capable of withstanding active and at-rest earth pressures. Backfill soils adjacent to these structures should consist of freely draining granular fill composed primarily of coarse to fine sand. With an active earth pressure coefficient (K_a) of 0.33, level backfill, and an assumed maximum backfill soil unit weight of 140 pounds per cubic foot (pcf), an equivalent fluid pressure of 46 psf per foot of wall height should be used in design of retaining/below-grade walls which are free to rotate.

Retaining/below-grade walls and wall corners typically are restrained from lateral movement and should be designed using at-rest earth pressures. A coefficient of at-rest earth pressure (K_o) of 0.5, for a level backfill, is recommended for retaining/below-grade walls designed to resist at-rest earth pressures, which assume no lateral movement. With an assumed maximum total unit weight of backfill of approximately 140 pcf, an equivalent fluid pressure of 70 pounds per square foot per foot of wall height should be used in design of restrained retaining/below-grade wall and wall corners. A coefficient of friction of 0.4 against sliding can be used for concrete on the existing site soils. Additional lateral earth pressures from a sloped backfill or any temporary or long-term surcharge loads also should be included in the design. Retaining wall design should include a global stability analysis.

Whitestone recommends that granular soils be used to backfill behind retaining walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 U.S. Standard sieve. Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

Positive drainage should be provided at the base of the below-grade walls. Where wall drainage is not provided or cannot be relied upon, walls are designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

4.7 Excavations

The site soils encountered during the investigation generally are most consistent with, at least, Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) that require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented. Competent bedrock may be excavated at an angle of 1:6 (horizontal:vertical). A steeper temporary excavation angle in the bedrock may be feasible, if the exposed bedrock is reviewed by a professional engineer or geologist.

5.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that any encountered underground structures are properly backfilled, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to synthetic turf and pavement support should be witnessed and documented by the owner's geotechnical engineer, who should also monitor drilled pier construction.

6.0 CLOSING

Whitestone's geotechnical division appreciates the opportunity to be of service to Appel Osborne Landscape Architecture and North Syracuse Central School District. Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein. Please contact us at (585) 252-6879 with any questions regarding this report.

Sincerely,

WHITESTONE

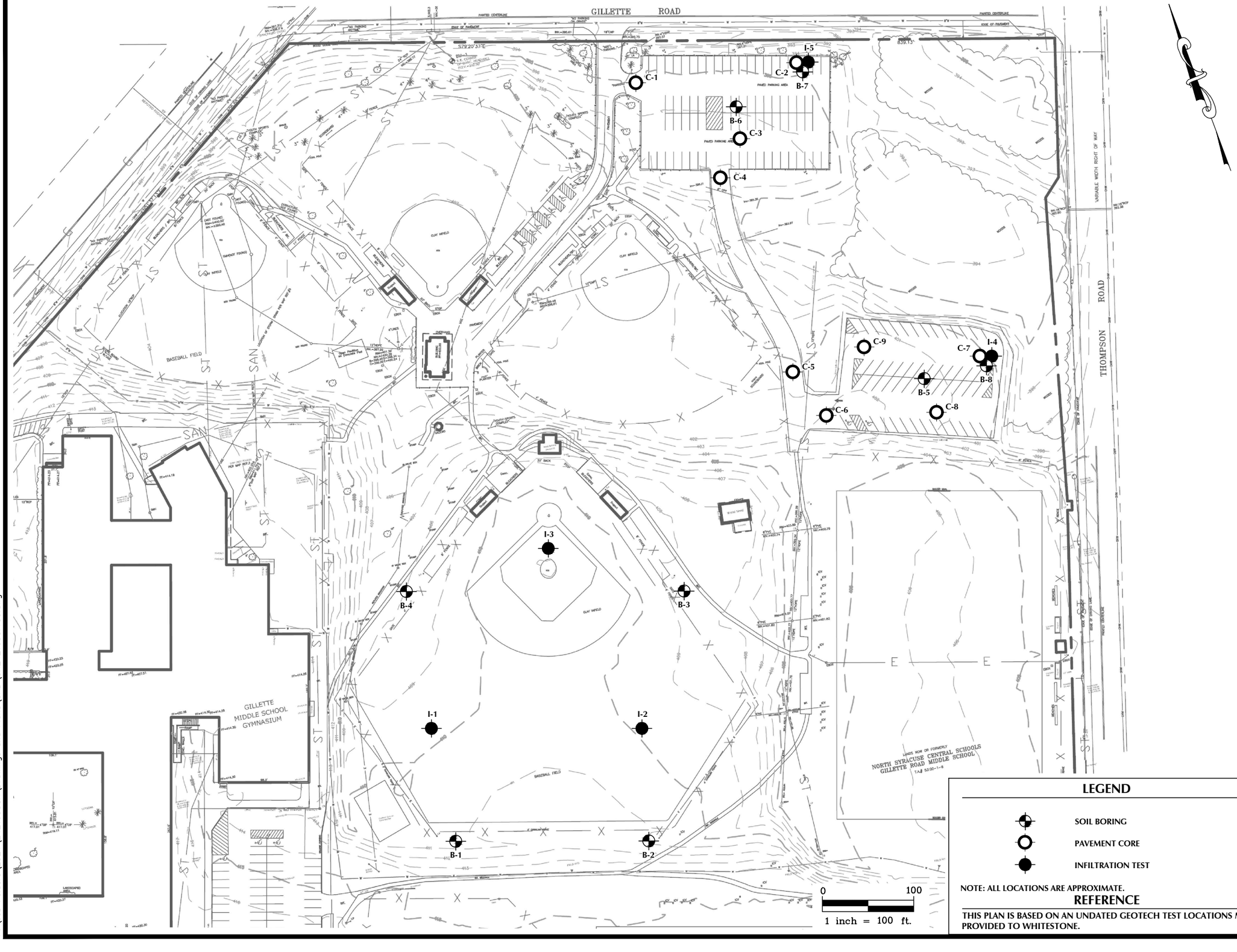
Charles B. Guzzetta, P.G.
Regional Manager, Upstate New York

Ryan R. Roy, P.E.
Vice President

RWM/th P:\Data\Job Folders\2024\2421693GR\Reports and Submittals\Appel Gillette MS Cicero NY GR2421693.Y00 LimGI 5-30-24.doc
Enclosures: Asphaltic Concrete Core Photographs
Dynamic Cone Penetrometer Test Results
Bedrock Core Photograph
Copy: Laurence W. Keller, P.E., Whitestone Associates, Inc.

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FIGURE 1
Test Location Plan



LEGEND

- SOIL BORING
- PAVEMENT CORE
- INFILTRATION TEST

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON AN UNDATED GEOTECH TEST LOCATIONS MAP PROVIDED TO WHITESTONE.

WHITESTONE

500 CANAL VIEW BOULEVARD, SUITE 700, ROCHESTER, NY 14623
585.252.6879 WHITESTONEASSOC.COM

DRAWING TITLE:
TEST LOCATION PLAN

CLIENT:
NORTH SYRACUSE CENTRAL SCHOOL DISTRICT
c/o APPEL OSBORNE LANDSCAPE ARCHITECTURE

PROJECT:
PROPOSED GILLETTE ROAD MIDDLE SCHOOL PROJECT
6150 SOUTH BAY ROAD
CICERO, ONONDAGA COUNTY, NEW YORK

PROJECT #: GR2421693.Y00	
DESIGNED BY: MR	PROJ. MGR.: CG
DATE: 5/21/24	FIGURE: 1
SCALE: 1" = 100'	

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APPENDIX A
Records of Subsurface Exploration

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	10.2 feet bgs	**Date Completed:**	4/14/2024				
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	-- | --	**At Completion:**	-- | --
		Equipment:	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 1.8	S-1	X	1 - 8 - 45 - 50/4"	10	53	1.0	TS		6" Topsoil	
							LACUSTRINE		Reddish-Brown, Medium Dense, Sandy Silt (ML)	
							WR		Weathered Bedrock	
2 - 2.8	S-2	X	46 - 50/4"	6	-				As Above (WR)	
4 - 4.4	S-3	X	50/5"	4	-				As Above (WR)	
						5.0				
6 - 6.4	S-4	X	50/5"	4	-				As Above (WR)	
8 - 8.3	S-5	X	50/3"	1	-				As Above (WR)	
						10.0				
10 - 10.2	S-6	X	50/2"	0	-				No Recovery	
									Boring Log B-1 Terminated at Depth of 10.2 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/12/2024		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	19.5 feet bgs	**Date Completed:**	4/13/2024				
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	-- | --	**At Completion:**	-- | --
	NQ2 Core	**Equipment:**	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		1 - 9 - 15 - 18	20	24		TS		6" Topsoil	
							WR		Weathered Bedrock (WR)	
2 - 3.9	S-2		19 - 38 - 50 - 50/5"	12	88				As Above (WR)	
4 - 5.9	S-3		39 - 45 - 49 - 50/5"	10	94	5.0			As Above (WR)	
6- 6.7	S-4		36 - 50/2"	6	-				As Above (WR)	
8 - 10	S-5		15 - 10 - 27 - 38	12	37				As Above (WR)	
2 - 2.8	S-6		46 - 50/4"	6	-	10.0			As Above (WR)	
			Time (minutes/ft)	Rec.	RQD					
14.5 - 19.5	C-1	NQ2		31" 52%	RQD 0%	15.0			Reddish-Brown to Green, Weathered, Very Fine Grained, Thinly Bedded, Soft to Medium Hard, Shale	
						20.0			Boring Log B-2 Terminated at Depth of 19.5 feet below ground surface.	
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/12/2024		**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)
Termination Depth:	23.9 feet bgs	**Date Completed:**	4/12/2024				
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	13.5 | --	**At Completion:**	-- | --
		Equipment:	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		8" Topsoil	
0 - 2	S-1	X	1 - 4 - 6 - 6	16	10		EXISTING FILL		Reddish-Brown to Black, Loose to Medium Dense, Sandy Silt with Gravel (FILL)	
2 - 4	S-2	X	8 - 6 - 5 - 6	12	11				As Above, Medium Dense (FILL)	
4 - 6	S-3	X	3 - 3 - 9 - 11	20	12	5.0			As Above, Loose (FILL)	w/c = 22.5%
							LACUSTRINE DEPOSIT		Brown, Medium Dense, Sandy Silt (ML)	
6 - 8	S-4	X	8 - 12 - 16 - 20	22	28				As Above (ML)	w/c = 18.9%
8 - 10	S-5	X	4 - 4 - 3 - 3	24	7				Brown, Medium Stiff, Silty Clay (CL)	w/c = 25.2%
10 - 12	S-6	X	3 - 3 - 2 - 3	24	5	10.0			As Above (CL)	w/c = 29.5%
						15.0				
15 - 17	S-7	X	2 - 1 - 1 - 1	12	2				Brown, Very Loose, Silty Sand (SM)	w/c = 34.1%
						20.0				
20 - 22	S-8	X	8 - 12 - 15 - 25	12	27		GLACIAL TILL		Reddish-Brown, Medium Dense, Sandy Silt with Gravel (ML)	w/c = 14.7%
23 - 23.9	S-9	X	38 - 50/5"	8	-				As Above, Very Dense (ML)	w/c = 18.2% Cobbles
						25.0			Boring Log B-3 Terminated at Depth of 23.9 feet below ground surface.	

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/13/2024		
Termination Depth:	10.3 feet bgs	**Date Completed:**	4/13/2024		
Proposed Location:	Synthetic Turf / Light Poles	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		WOH - 1 - 4 - 5	19	5		TS		12" Topsoil	
							EXISTING FILL		Brown to Black, Loose, Sandy Silt with Gravel (FILL)	
						2.0				
2 - 4	S-2		6 - 8 - 8 - 18	14	16		LACUSTRINE DEPOSIT		Reddish-Brown, Medium Dense, Sandy Silt (ML)	w/c = 21.6%
						4.0				
4 - 6	S-3		17 - 24 - 36 - 49	12	60	5.0	WR		Weathered Bedrock (WR)	
6 - 6.4	S-4		50/5"	4	-				As Above (WR)	
8 - 8.4	S-5		50/5"	3	-				As Above (WR)	
						10.0				
10 - 10.3	S-6		50/3"	2	-				As Above (WR)	
									Boring Log B-4 Terminated at Depth of 10.3 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024	**Water Depth | Elevation** (feet bgs) | (ft NAVD88)		**Cave-In Depth | Elevation** (feet bgs) | (ft NAVD88)	
Termination Depth:	4.2 feet bgs	**Date Completed:**	4/14/2024				
Proposed Location:	Parking	**Logged By:**	WJ	**During:**	-- | --		
Drill / Test Method:	SPT (Autohammer)	**Contractor:**	EE	**At Completion:**	-- | --	**At Completion:**	-- | --
		Equipment:	CME 550	**24 Hours:**	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		1.5" Asphalt	Cored
							GRAVEL		7" Granular Subbase	
0.2 - 2.2	S-1	X	7 - 16 - 21 - 18	20	37	2.0	EXISTING FILL		Reddish-Brown, Dense, Sandy Silt with Gravel (FILL)	
							WR		Weathered Bedrock (WR)	
2.2 - 4.2	S-2	X	23 - 15 - 17 - 9	16	32				As Above (WR)	
						5.0			Boring Log B-5 Terminated at Depth of 4.2 feet below ground surface.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024		
Termination Depth:	4.0 feet bgs	**Date Completed:**	4/14/2024		
Proposed Location:	Parking	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		6.3" Asphalt	Cored
0.5 - 2	S-1	X	17 - 10 - 12	11	22		GRAVEL		8" Granular Subbase	
							EXISTING FILL		Reddish-Brown, Medium Dense, Sandy Silt with Gravel (FILL)	
2 - 4	S-2	X	8 - 6 - 4 - 4	6	10				As Above, Loose to Medium Dense (FILL)	
						5.0			Boring Log B-6 Terminated at Depth of 4.0 feet below ground surface.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Page 1 of 1

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024	**Water Depth | Elevation (feet bgs) | (ft NAVD88)**	**Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)**
Termination Depth:	9.0 feet bgs	**Date Completed:**	4/14/2024		
Proposed Location:	SWM Area / Parking	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		3.3" Asphalt	Cored C-2
							GRAVEL		6" Granular Subbase	
0.5 - 2	S-1	X	16 - 10 - 6	9	16		EXISTING FILL		Reddish-Brown to Black, Medium Dense, Sandy Silt (FILL)	
2 - 4	S-2	X	3 - 3 - 3 - 3	8	6	4.0			As Above, Loose (FILL)	
						5.0	LACUSTRINE DEPOSIT			
5 - 7	S-3	X	5 - 2 - 3 - 3	14	5				Gray-Brown, Medium Stiff, Silty Clay (CL)	Infiltration test @ 5.7 fbgs
7 - 9	S-4	X	5 - 9 - 8 - 7	20	17				As Above, Very Stiff (CL)	
						10.0			Boring Log B-7 Terminated at Depth of 9.0 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-8

Project:	Proposed Gillette Road Middle School Improvements	**WAI Project No.:**	GR2421693.Y00
Location:	6150 South Bay Road, Cicero, Onondaga County, New York	**Client:**	North Syracuse Central School District

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± NS feet Above NAVD88	**Date Started:**	4/14/2024		
Termination Depth:	9.0 feet bgs	**Date Completed:**	4/14/2024		
Proposed Location:	SWM Area / Parking	**Logged By:**	WJ	**During:** -- | --	
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	EE	**At Completion:** -- | --	**At Completion:** -- | --
		Equipment:	CME 550	**24 Hours:** -- | --	**24 Hours:** -- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							PAVEMENT		1" Asphalt (deteriorated); 6" Granular Subbase	Cored C-7
0.5 - 2	S-1	X	9 - 4 - 6	10	10		LACUSTRINE DEPOSIT		Reddish-Brown, Loose to Medium Dense, Silt (ML)	
2 - 4	S-2	X	10 - 6 - 3 - 3	6	9				As Above, Loose (ML)	
						5.0				Infiltration test @ 4.5 fbgs
5 - 7	S-3	X	8 - 6 - 11 - 11	8	17				Brown, Medium Dense, Sandy Silt (ML)	
7 - 9	S-4	X	5 - 5 - 5 - 6	24	10				As Above, Loose to Medium Dense (ML)	
						10.0			Boring Log B-8 Terminated at Depth of 9.0 feet below ground surface.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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APPENDIX B
Asphaltic Concrete Core Photographs & Bedrock Core Photographs

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ASPHALTIC CONCRETE CORE PHOTOGRAPHS - 1



1. CORE C-1 (4″ Asphalt; 8″ Subbase)



2. CORE C-2 (3.3″ Asphalt; 7″ Subbase)



3. CORE C-3 (7″ Asphalt; 7″ Subbase)



4. CORE C-4 (2.5″ Asphalt; 11″ Subbase)

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ASPHALTIC CONCRETE CORE PHOTOGRAPHS - 2



5. CORE C-5 (1.5″ Asphalt; 6″ Subbase)



6. CORE C-6 (3.5″ Asphalt; 6.5″ Subbase)



7. CORE C-7 (1″ Asphalt; 6″ Subbase)



8. CORE C-8 (1″ Asphalt; 6.5″ Subbase)

WHITESTONE

ASPHALTIC CONCRETE CORE PHOTOGRAPHS - 3



9. CORE C-9 (1″ Asphalt; 6″ Subbase)



10. BORING B-5 (2.5″ Asphalt; 7″ Subbase)



11. BORING B-6 (6.3″ Asphalt; 8″ Subbase)

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BEDROCK CORE PHOTOGRAPH



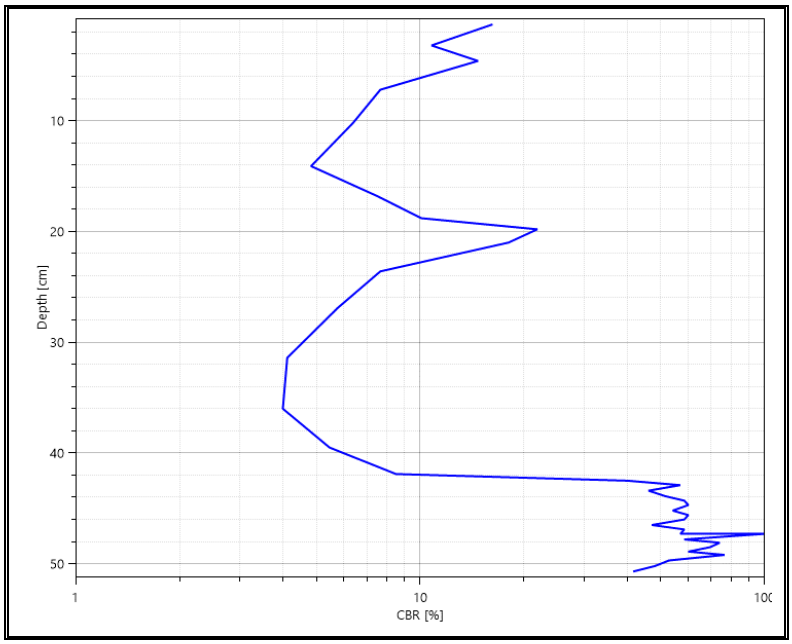
1. BORING B-2: Run 1: 14.5 to 19.5 feet below ground surface

WHITESTONE

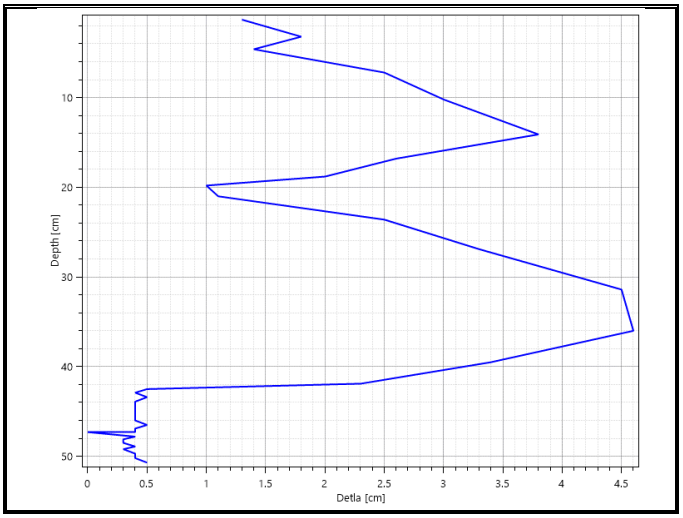
APPENDIX C
Dynamic Cone Penetrometer Test Results

WHITESTONE

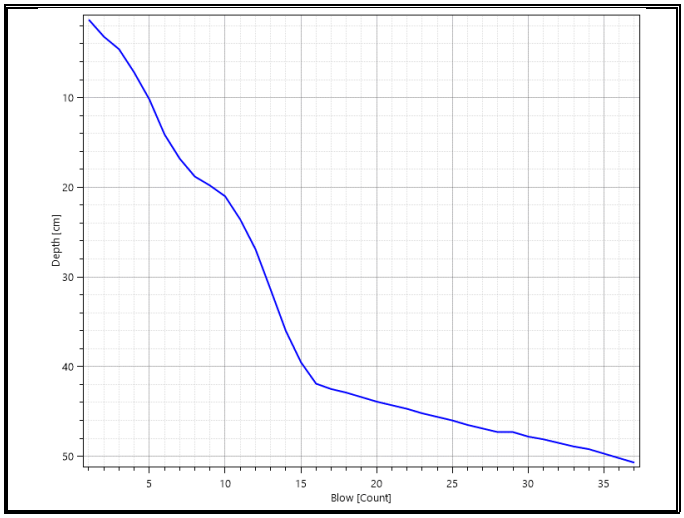
DYNAMIC CONE PENETROMETER TEST RESULTS
Core C-1
North Syracuse Central School District - Gillette Road Middle School
Cicero, Onondaga County, New York



Depth -vs- Inferred California Bearing Ratio



Penetration per blow

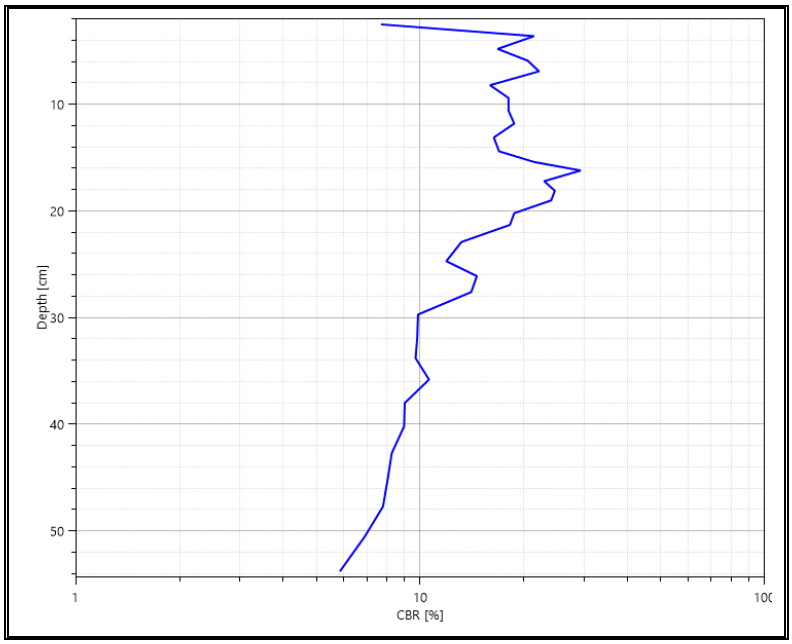


Cumulative blows -vs- Depth

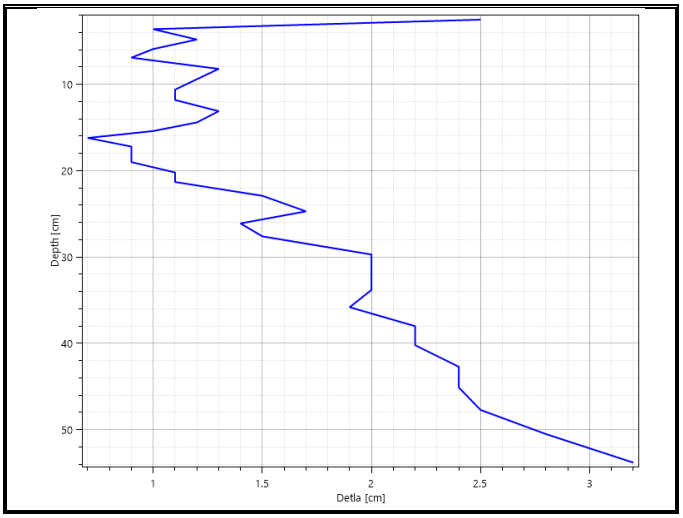
Vertek Smart DCP System (ASTM D6951)

WHITESTONE

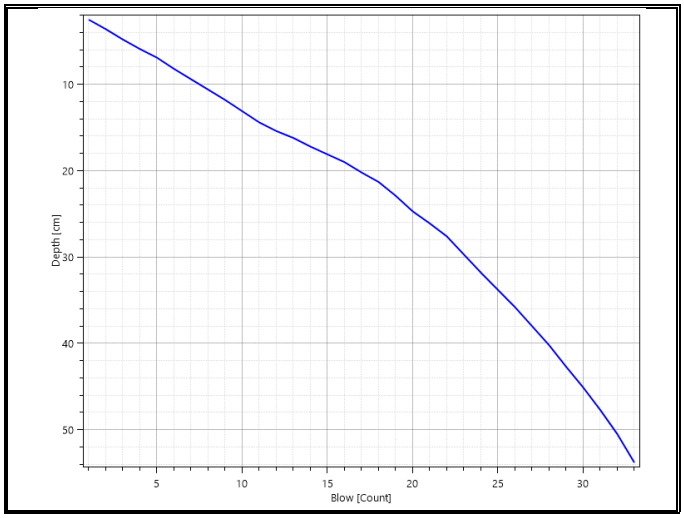
DYNAMIC CONE PENETROMETER TEST RESULTS
Core C-5
North Syracuse Central School District - Gillette Road Middle School
Cicero, Onondaga County, New York



Depth -vs- Inferred California Bearing Ratio



Penetration per blow

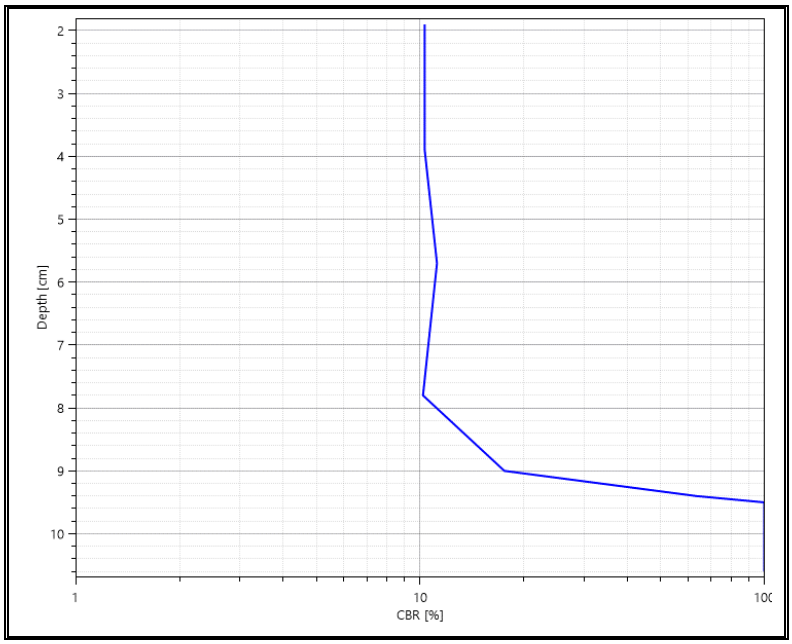


Cumulative blows -vs- Depth

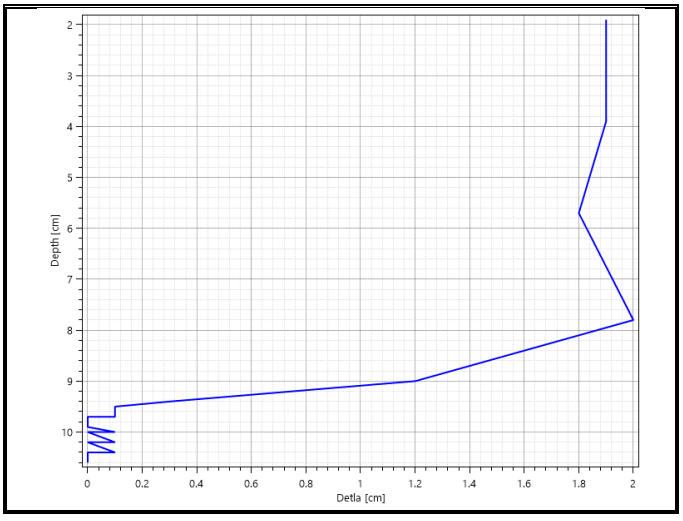
Vertek Smart DCP System (ASTM D6951)

WHITESTONE

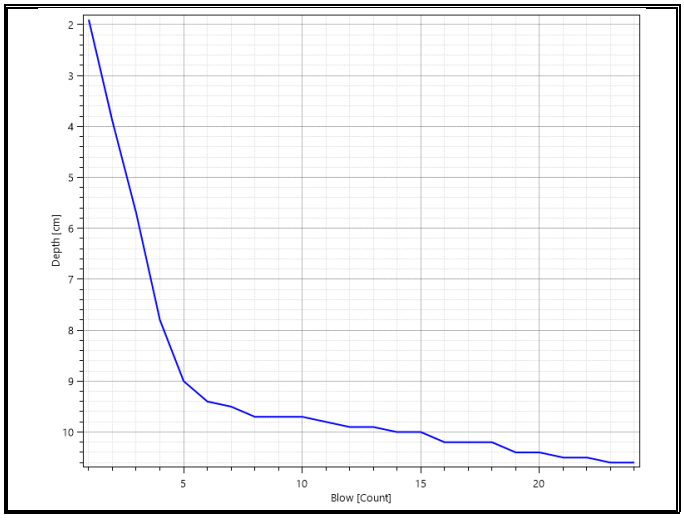
DYNAMIC CONE PENETROMETER TEST RESULTS
Core C-8
North Syracuse Central School District - Gillette Road Middle School
Cicero, Onondaga County, New York



Depth -vs- Inferred California Bearing Ratio



Penetration per blow



Cumulative blows -vs- Depth

Vertek Smart DCP System (ASTM D6951)

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APPENDIX D
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE

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SUITE 700
ROCHESTER, NY 14623
585.252.6879
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM - Rochester.docx

WHITESTONE

500 CANAL VIEW BOULEVARD
SUITE 700
ROCHESTER, NY 14623
585.252.6879
whitestoneassoc.com

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

SECTION 271000 - HORIZONTAL AND BACKBONE COMMUNICATION CABLING

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents. This work includes sleeves, raceways, cable hangers, connectors, outlets, patch panels, termination, testing, and labeling.

1.2 SCOPE OF WORK

A. Horizontal cabling includes Shielded-Twisted Pair (STP) to access control system, analog speakers, and security system equipment and devices as required by the manufacturer and called for on the drawings.

B. Horizontal cabling includes Category 6 UTP and for IP Cameras and Emergency Communication Devices, and 6A UTP for all data outlets and Wireless Access Points from the Communications Equipment Room (CER) to the outlets as called for on the drawings. The horizontal cabling includes all horizontal cables, patch panels, patch cables, termination, testing, and mechanically terminated jacks/inserts and faceplates in the work area and the mechanical termination in the CER.

C. Provide the below installed patch cable installations. Coordinate with owners IT representative for specific ports to connect. Turn all unused patch cables over to owners IT representative at end of project and obtain sign off sheet to include with O&Ms.

1. Provide (300) Cat. 6 1-foot Patch Cables

2. Provide (600) Cat. 6A 1-foot Patch Cables

3. Provide (30) 1-meter single-mode Optical Fiber Patch Cables

4. Provide (10) 2-meter single-mode Optical Fiber Patch Cables

5. Provide (30) 1-meter OM4 multimode-mode Optical Fiber Patch Cables

6. Provide (10) 2-meter OM4 multimode-mode Optical Fiber Patch Cables

D. Provide the below installed spare UTP cable installations. Utilization of all installed spare cables shall be at the direction of the architect and engineer and will be tracked during construction on spreadsheet.

1. Provide (30) installed spare cat. 6 cables. Each installed cable shall include up to 300-feet of specified cat. 6 cable with termination, testing, and labeling at each end. Provide up to 20-feet of V2400 surface metal raceway, surface metal backbox, outlet, and RJ-45 cat. 6 jack at station end for each cable. Provide required supports and sleeves for distribution.

2. Provide (30) installed spare cat. 6A cables. Each installed cable shall include up to 300-feet of specified cat. 6A cable with termination, testing, and labeling at each end. Provide up to 20-feet of V2400 surface metal raceway, surface metal backbox, outlet, and RJ-45 cat. 6A jack at station end for each cable. Provide required supports and sleeves for distribution.

3. Installed spare UTP cable log spreadsheet template:

Quantity of Remaining spare Cat. 6A installations (30)	Date	Building Name	Spare Cat. 6A cables installed	Room Number Cables Installed
Quantity of Remaining spare Cat. 6 installations (30)	Date	Building Name	Spare Cat. 6 cables installed	Room Number Cables Installed

E. District Wide Color Code for outer jacket of all Horizontal Cabling.

1. IP Cameras – Horizontal Cabling and Patch Cables and Connecting Hardware: ORANGE

2. Emergency Communication Devices - Horizontal Cabling and Patch Cables and Connecting Hardware: BLUE

3. Data and WAP – Horizontal Cabling and Patch Cables and Connecting Hardware: BLUE

F. Provide 15-foot service loop of horizontal cable at each WAP outlet location. Neatly coil and Velcro wrap the service loop in an accessible location.

G. Backbone cabling includes interior and exterior multi-mode and single-mode optical fiber run between CERs (Communication Equipment Rooms) and between buildings. Additional required components include patch panels, connectors, patch cables, splice cases, termination, and testing.

H. Horizontal cabling includes audio and video cabling as indicated on the drawings.

I. This section includes minimum requirements for the following:

1. Cat. 6 Cabling

2. Cat. 6 Patch Cables

3. Cat. 6A Cabling

4. Cat. 6A Patch Cables

5. Connecting Hardware

6. 100 Ohm UTP Cable Testing

7. Optical Fiber Cabling

8. Optical Fiber Patch Cables

9. Optical Fiber Connectors

10. Fusion Splicing

11. Optical Fiber Testing

12. Audio/Video (A/V) Cabling and Accessories

13. STP Cabling

1.3 QUALITY ASSURANCE

A. All cable shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Provide with the submittals, documentation from an independent testing agency indicating that the complete assembly including cable and termination hardware has been tested and meets the performance criteria called for.

C. Provide contractor or sub-contractor experienced in all telephone and fiber splicing and trained and experience with the fusion splicing equipment to be used on this project.

D. Materials and work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA – 568-A

2. ANSI/TIA/EIA – 568-C

3. ANSI/TIA/EIA – 569-B

4. NFPA 70 - 2014

5. BICSI Telecommunications Distribution Methods Manual

6. FCC 47 CFR 68

7. NEMA - 250

8. NEC - Articles 770 and 800

1.4 SUBMITTALS

A. Manufacturers catalog sheets, specifications and installation instructions for all products in this section.

B. Fusion splicing kits, pigtails, and splice trays.

C. Test results for all telephone and data UTP cable, and fiber splicing, new fiber cable installations performed in this project. Submit immediately upon completion of cable installation for review and include second copy in final O&M manuals.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Provide an end-to-end connectivity solution in which all horizontal cabling and connecting hardware are made by the same manufacturer. At a minimum, all connecting hardware and UTP patch panels shall be from the same manufacturer. Refer to specification section 271100 for additional information regarding patch panels.

2.2 CAT. 6 CABLING (100 OHM UNSHIELDED TWISTED PAIR)

A. Shall be Category 6 type cable compliant with the requirements of the most current edition of the 568-B.2-1 standard.

B. Physical Characteristics:

1. Shall be CMP, plenum rated.

2. Conductor shall be 23 AWG solid bare annealed copper.

3. Category marking shall be printed every one foot. Footage indicators shall also be provided on jacket.

4. The diameter of the insulated conductor shall be .023 in. maximum.

5. Shall consist of (4) twisted pairs.

6. Shall be suitable for the environment in which they are to be installed.

7. The color coding of pairs shall be:

Pair 1	W-BL; BL
Pair 2	W-O; 0
Pair 3	W-G; G
Pair 4	W-BR; BR

8. The overall diameter of the cable shall be less than 0.240 inches.

9. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.

10. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.

C. Transmission Characteristics:

1. Cable shall be tested & characterized to 500 MHz.

a. Cable shall exhibit a NEXT loss of at least the following:

Frequency MHz	NEXT dB
1.0	78
4.0	69
10.0	63
16.0	60
20.0	58
31.25	55
62.5	51
100.0	48
200	44
250	42

b. Cable shall exhibit an ELFEXT loss of at least the following:

Frequency MHz	ELFEXT dB
1.0	75
4.0	63
10.0	55
16.0	51
20.0	49
31.25	45
62.5	39
100.0	35
200	29
250	27

c. Cable shall exhibit an Attenuation loss of less than the following:

Frequency MHz	Attenuation dB
1.0	2.0
4.0	3.8
10.0	6.0
16.0	7.6
20.0	8.5
31.25	10.7
62.5	15.4

100.0	19.8
200	29.0
250	32.58

d. Cable shall exhibit a Return loss according to the following:

Frequency MHz	Return Loss (dB)
1	20.0
4	23.0
10	25.0
16	25.0
20	25.0
31.25	23.6
32.5	21.5
100	20.1
200	18.0
250	17.3

D. Design Make: Belden DataTwist 2400 Series

E. Acceptable Manufacturers:

1. OCC

2. Bertek

3. Commscope

2.3 OUTSIDE PLANT CAT. 6 CABLING

A. Meets all above performance requirements for 100 OHM unshielded twisted pair cable (cat. 6 cable).

B. The cable is suitable for use in buildings and in wet locations in ductbanks and for aerial lashing. It is fully water blocked with a flooded core.

C. UL (USA) & cUL (Canada) listed for this by passing UL 1581 vertical tray flame test.

D. Black UV resistant UV-FR polyolefin outer jacket.

E. Bend Radius: 2.75”

F. Pulling Tension: 25 lbf

G. Design Make: Mohawk VersaLAN® Indoor/Outdoor Series

2.4 CAT. 6 PATCH CABLES

A. Category 6 - TIA 568.C.2 compliant.

B. Ultra-small diameter patch cord.

C. Max. 28 AWG conductors.

D. Factory terminated RJ-45 male at both ends with strain relief boot at each end of cable. T568A/B-T568A/B.

E. 1-foot in length minimum.

F. Design Make: Belden Small OD 28 AWG Patch Cords

G. Acceptable Manufacturers:

1. Legrand Quicktron Snagless Slim Patch Cable

2. Panduit UTP2SP1 Series

2.5 CAT. 6A CABLING (100 OHM UNSHIELDED TWISTED PAIR)

A. Shall be Category 6A type cable compliant with the requirements of the most current edition of the TIA/EIA-568-B.2-10-2008 standard.

B. Physical Characteristics:

1. Shall be CMP, plenum rated.

2. Conductor shall be 23 AWG solid bare annealed copper.

3. Category marking shall be printed every one foot. Footage indicators shall also be provided on jacket.

4. The diameter of the insulated conductor shall be .023 in. maximum.

5. Shall consist of (4) twisted pairs.

6. Shall be suitable for the environment in which they are to be installed.

7. The color coding of pairs shall be:

Pair 1	W-BL; BL
Pair 2	W-O; 0
Pair 3	W-G; G
Pair 4	W-BR; BR

8. The overall diameter of the cable shall be no greater than 0.295 inches.

9. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.

10. Cable shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.

C. Transmission Characteristics:

1. Cable shall be tested & characterized to 625 MHz.

a. Cable shall exhibit a PSNEXT loss of at least the following:

Frequency MHz	NEXT dB
1.0	73.3
4.0	64.3
10.0	58.3
16.0	55.2
20.0	53.8
31.25	50.9
62.5	46.4
100.0	43.3
200	38.8
250	37.3
300	36.1
400	34.3
500	32.8
625	31.4

b. Cable shall exhibit an Attenuation loss of less than the following:

Frequency MHz	Attenuation dB
1.0	2.1
4.0	3.8
10.0	5.9
16.0	7.5
20.0	8.4
31.25	10.5
62.5	15.0
100.0	19.1
200	27.6
250	31.1
300	34.3
400	40.1
500	45.3
625	51.2

c. Cable shall exhibit a Return loss according to the following:

Frequency MHz	Return Loss (dB)
1	20.0
4	23.0
10	25.0
16	25.0
20	25.0
31.25	23.6

62.5	21.5
100	20.1
200	18.0
250	17.3
300	16.8
400	15.9
500	15.2
625	14.5

D. Design Make: Belden 10GX13 Series

E. Acceptable Manufacturers:

1. OCC
2. Bertek
3. Commscope

2.6 CAT. 6A PATCH CABLES

A. Meets all above requirements for 100 OHM unshielded twisted pair cable (Cat. 6A cable), except stranded conductors.

B. Factory terminated RJ-45 male at both ends with strain relief at ends of the cable.

C. Ultra-small diameter patch cord.

D. 1-foot in length.

E. Design Make: Belden CAD110XXX Series

F. Acceptable Manufacturers:

1. OCC
2. Bertek
3. Commscope

2.7 COPPER CONNECTING HARDWARE

A. Color shall be electric white or ivory unless otherwise noted below.

B. Physical Characteristics

1. Faceplates shall be provided with labels and plastic label protector strip.
2. Faceplates shall be modular keystone jack type, 4-port minimum or 1-gang opening with mounting bezels to accept combination keystone jacks and multimedia jacks.

3. Each jack shall be an individually constructed unit and shall snap mount into the faceplate keystone opening.

4. Jack housings shall be high impact 94 V-0 rated thermoplastic.

5. Jacks shall have a temperature rating of -10 °C (14°F) to 60°C (140 °F) in conformance with ANSI/TIA/EIA-568-A.

6. Jack housings shall fully encase and protect printed circuit boards and IDC fields.

7. Housing shall be ultrasonically welded for tamper resistance.

8. Modular jack contacts shall accept a minimum of 2500 mating cycles without degradation of electrical or mechanical performance.

9. UTP jack IDCs shall accept a minimum of 20 re-terminations without degradation of electrical or mechanical performance.

10. Contacts will maintain a minimum vertical deflection force of 100 grams over deflection window.

11. Modular jack contact wires shall be formed flat for increased surface contact with mated plugs.

12. Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.

13. Jack termination shall follow the industry standard 110 IDC. Includes insulated barrier between IDC contacts.

14. Jacks shall have a designation indicating the cable type on the nose which can be plainly seen from the front of the faceplate.

15. Jacks shall utilize a paired punch down sequence. Cable pair twists shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.

16. Jacks shall terminate 22-26 AWG stranded or solid conductors.

17. Jacks shall include wire retention stuffer cap that hold terminated wires in place and allow the conductors to be visually inspected in the IDC housing.

18. Jacks shall be color code marked with both T-568A and T-568B wiring.

C. RJ-45 Jack Design Makes:

1. Cat. 6A Data Jacks +18” AFF (Blue Colored)

2. Cat. 6 Data Jacks +18” AFF (Yellow Colored)

3. Voice Jacks at +18” AFF (Blue Colored)

4. Voice Jacks +48” AFF in Plastic Wall Mount Phone Bracket w/ Metal Ears – Belden AX102902 w/ Blue Cat. 6 Jack

5. Design Make: Belden AX10XXXX Series

D. Multimedia & Accessory Jack Design Makes:

1. Blank Jack Snap-In –Belden AX102262

2. HDMI coupler – Belden AX105345-XX

3. USB 3.0 Coupler, A to A – Belden AX105342-XX

4. Other components and mounting bezels/inserts as required for special mounting conditions and for floor boxes, surface raceways and modular furniture.

E. Faceplate Design Makes:

1. Single Gang 4-Port Faceplate w/ ID Windows – Belden AX102249

2. Single Gang Faceplate for Combination Multimedia & Data Jacks – Belden AX101747. Provide w/ required bezels/inserts

F. Acceptable Manufacturers:

1. Panduit

2. Hubbell

3. Legrand

2.8 100 OHM UTP TESTER

A. User Interface

1. 240 x 320 backlit LCD display

2. Date stamp of all tests

3. Tone generation audio warning

B. Physical interface shall be modular RJ-45 connector and a serial port with DB-9 connector.

C. Shall test cable for compliance with the following standards:

1. TIA Category 3, 5E, 6 and 6A: 100 Ohm

2. ISO/IEC 11801 and EN 50173 Class C and D: Link

3. ISO/IEC 11801 and EN 50173 Class C and D (new): Permanent Link or Channel

4. Aus/NZ Class C and D: Basic Link or Channel

5. STP cabling, (IBM Type 1, 150 □)

6. ANSI TP-PMD IEEE 802.3 10BASE5, 10BASE2: Ethernet with coaxial cabling

7. IEEE 802.3 10BASE-T, 100BASE-TX, 1000BASE-T: Ethernet with twisted pair cabling IEEE 802.5: Token Ring, 4 Mbps or 16 Mbps

D. Shall perform the following tests as a minimum:

1. NEXT, NEXT @ Remote

2. Wire Map

3. Characteristic Impedance

4. Length

5. DC Loop Resistance

6. Propagation Delay Return Loss (RL), RL @ Remote

7. Delay Skew

8. Attenuation

9. Attenuation-to-Crosstalk Ratio (ACR), ACR @ Remote

10. Power Sum ACR, PSACR @ Remote

11. ELFEXT, ELFEXT @ Remote

12. Power Sum ELFEXT, PSELFEXT @ Remote

13. Power Sum NEXT, PSNEXT @ Remote

E. Shall use injector for complete wire mapping and TDR for determining cable length.

F. Shall measure NEXT for all six pair combinations and Attenuation on all four pairs from 1.0 to 500 MHz.

G. Design Make: Fluke “DSX-5000” or Approved Equal

H. Acceptable Manufacturers:

1. WaveTek

2. Lantek

2.9 INTERIOR GRADE OPTICAL FIBER CABLE

A. Cable shall be plenum rated and meet the requirements Flame Test: UL 910.

B. Fiber Characteristics

1. All fibers in the cable must be usable fibers and meet required specifications.

2. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.

3. Each optical fiber shall consist of a doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design.

4. All optical fibers shall be proof tested by the fiber manufacturer at a minimum of 100 kpsi.

5. The fiber shall be coated with a dual layer acrylate protective coating. The coating shall be in physical contact with the cladding surface.

6. The coated fiber shall have a layer of Teflon® placed between the dual layer acrylate coating of the optical fiber and the thermoplastic buffer. The diameter of the thermoplastic buffer coating shall be 900 ± 50 μm.

7. The fiber coating and buffer shall be removable with commercially available stripping tools in a single pass.

C. The multimode fiber utilized in the cable specified herein shall meet EIA/TIA-492AAAC-B, Detail Specification for type OM4 50 μm Core Diameter/125 μm Cladding Diameter Multimode Optical Fibers.

1. Optimized Data Rates: 1 Gb/s over 1000 m & 10 Gb/s over 300 m.

2. Core diameter: 50 ± 2.5 μm.

3. Cladding diameter: 125.0 ± 1.0 μm.

4. Core-to-Cladding Offset: ≤ 2.0 μm.

5. Cladding non-circularity: ≤ 1.0 %.

6. Core non-circularity: ≤ 5.0 %.

7. Coating Diameter: 245 ± 5 μm

8. Attenuation Uniformity: There shall be no point discontinuities greater than 0.2 dB at either 850 nm or 1300 nm.

D. The non-dispersion shifted single-mode fiber utilized in the cable specified herein shall conform to the following specifications:

1. Typical Core Diameter: 8.3 μm.

2. Cladding Diameter: 125.0 ± 1.0 μm.

3. Core-to-Cladding Offset: ≤ 0.6 μm.

4. Cladding Non-Circularity: ≤ 1.0%.

5. Coating Diameter: 245 ± 10 μm.

6. Attenuation Uniformity- No point discontinuity greater than 0.1 dB at either 1310 nm or 1550 nm.

7. Attenuation at the Water Peak- The attenuation at 1383 ± 3 nm shall not exceed 2.1 dB/km.

8. Cutoff Wavelength- The cabled fiber cutoff wavelength shall be < 1260 nm.

9. Mode Field Diameter: 9.30 ± 0.50 μm at 1310 nm

   10.50 ± 1.00 μm at 1550 nm

10. Zero Dispersion Wavelength (λ_o)- 1301.5 nm ≤ λ_o ≤ 1321.5 nm.

11. Zero Dispersion Slope (S_o)- ≤ 0.092 ps/(nm²•km).

12. Fiber Curl: > 4.0 m radius of curvature.

E. Fiber Parameters

1. All fibers in the cable shall meet the requirements of this specification.

2. The attenuation specification shall be a maximum attenuation for each fiber at 23 ± 5°C.

3. The attenuation of the cabled fiber shall be uniformly distributed throughout its length such that there are no discontinuities greater than 0.1 dB at 1310 nm/1550 nm (single-mode) or 0.2 dB at 850 nm/1300 nm (multimode) in any one kilometer length of fiber.

F. Physical Characteristics

1. Plenum Cables up to 24 Fibers:

   a. The fibers may be stranded around a dielectric central member and surrounded by layered aramid yarns. The aramid yarns shall serve as the tensile strength member of the cable.

b. A ripcord shall be applied between the aramid yarns and the outer jacket to facilitate jacket removal.

c. The outer jacket shall be extruded over the aramid yarns for physical and environmental protection.

2. Strength Members:

a. The strength member shall be a high modulus aramid yarn.

b. The aramid yarns shall be helically stranded around the buffered fibers.

c. A non-toxic, non-irritant talc shall be applied to the yarn to allow the yarns to be easily separated from the fibers and the jacket.

3. Armored Cable Jacket:

a. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections.

b. The jacket shall have a consistent uniform thickness; jackets extruded under high pressure are not acceptable.

c. The jacket shall be smooth, as is consistent with the best commercial practice.

d. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.

e. The indoor tight-buffered distribution cable shall also include an aluminum interlocking armor. A continuous non-metallic coating shall be applied over the interlocking armor. The color of the armor jacket shall match the jacket color of the optical fiber cable located inside of the armor.

4. The cable and subunit jacket color shall be teal for cables containing multimode fibers. The cable and subunit jacket color shall be yellow for cables containing single-mode fibers. The cable and subunit jacket color shall be black for hybrid or indoor/outdoor cables.

5. For cables with more than two fibers, the cable jacket shall be designed for easy removal without damage to the optical fibers by incorporating a ripcord under each cable jacket. A non-toxic, non-irritant talc shall be applied to the aramid yarns to allow the yarns to be easily separated from the fibers and the jacket.

6. The nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, and environmental test requirements of this document over the life of the cable. The cable shall be all-dielectric.

G. Identification

1. The individual fibers shall be color coded for identification. The optical fiber color coding shall be in accordance with EIA/TIA-598, "Color Coding of Fiber Optic Cables." The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color coded buffered fibers shall not adhere to one another. When fibers are grouped into individual units, each unit shall be numbered on the unit jacket for identification. The number shall be repeated at regular intervals.

2. The outer cable jacket shall be marked with the manufacturer's name or file number, date of manufacture, fiber type, flame rating, listing mark, and sequential length markings every two feet. The marking shall be in contrasting color to the cable jacket.

H. Additional Requirements

1. The storage temperature range for the cable on the original shipping reel shall be -40°C to +70°C. The installation/operating temperature range for plenum cables shall be 0°C to +70°C. Testing shall be in accordance with FOTP-3.

2. Crush Resistance - The cable shall withstand a minimum compressive load of 890 N/cm (500 lbf/in) applied uniformly over the length of the compression plate. The cable shall have an aluminum or steel interlock armor that increases the crush resistance at least ten times that of standard fiber cable, typically 89 N/cm (50 lbf/in). The cable shall be tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables." While under compressive load, the fibers shall not experience an attenuation change greater than 0.4 dB at 1550 nm (single-mode) or greater than 0.6 dB at 1300 nm (multimode). After the compressive load is removed, the fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single-mode) or greater than 0.4 dB at 1300 nm (multimode).

3. Impact Resistance - The cable shall withstand a minimum of 20 impact cycles. The cable shall be tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies." The fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single-mode) or greater than 0.4 dB at 1300 nm (multimode).

4. Cyclic Flexing - The cable shall withstand 25 mechanical flexing cycles at a rate of 30 ± 1 cycles per minute. The cable shall be tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test." The fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single-mode) or greater than 0.4 dB at 1300 nm (multimode).

5. Flammability - All cables shall comply with the requirements of the National Electrical Code® (NEC®), Article 770. Plenum cables (OFNP and OFCP) shall pass UL-910.

I. Design Make: Corning MIC 250 Multi-mode (OM4) part number - XXXTD8-T1390-A3 and Single-mode (OS2) part number - XXXED8-T1301-A3. Where XXX represents the cable fiber count.

2.10 EXTERIOR GRADE OPTICAL FIBER

A. Shall be a multi-mode/single-mode cable with the quantity of fibers as called for on the cable riser diagram and/or drawings.

B. Outdoor cable for outdoor lashed aerial, ducts and Indoor when installed according to National Electric Code (NEC) Article 770. Cable shall meets or exceeds requirements for Inter-building fiber optic cables as outlined in GR-409-CORE.Design and Test Criteria ANSI/ICEA S-87-640.

C. Indoor/Outdoor cable shall be UL-listed type OFNP in accordance with NEC sections 770-179 (A) and 770-154 (A) for use in ducts, plenums, and air-handling spaces. Meets or exceeds requirements for intra-building fiber optic cables as outlined in GR-409-CORE.Design and Test Criteria ANSI/ICEA S-104-696; NFPA 262

D. General Fiber Characteristics

1. All fibers in the cable must be usable fibers and meet required specifications list above for interior grade optical fiber.

E. Physical Construction

1. Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 3.0mm.

2. Each buffer tube shall contain up to 12 fibers.

3. The fibers shall not adhere to the inside of the buffer tube.

4. Each fiber and each buffer tube shall be distinguishable by means of color coding in accordance with TIA/EIA-598-A, "Optical Fiber Cable Color Coding."

5. The fibers shall be colored with ultraviolet (UV) curable inks.

6. Buffer tube colored stripes shall be inlaid in the tube by means of co-extrusion when required. The nominal stripe width shall be 1 mm.

7. For dual layer buffer tube construction cables, standard colors shall be used for tubes 1 through 12 and stripes are used to denote tubes 13 through 24. The color sequence applies to tubes containing fibers only and shall begin with the first tube. If fillers are required, they shall be placed in the inner layer of the cable. The tube color sequence shall start from the inside layer and progress outward.

8. The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.900.

9. The central anti-buckling member shall consist of a dielectric, glass reinforced plastic (GRP) rod. The purpose of the central member is to prevent buckling of the cable. The GRP rod shall be overcoated with a black colored thermoplastic when required to achieve dimensional sizing to accommodate buffer tubes/fillers.

10. All interior buffer tubes shall be protected against water penetration by water blocking tapes and yarns that swell to absorb water.

11. Two polyester yarn binders shall be applied contrahelically with sufficient tension to secure each buffer tube layer to the dielectric central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking and dielectric with low shrinkage.

12. For single layer cables, a water blocking tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The tape shall be held in place by a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter.

13. For dual layer cables, a second (outer) layer of buffer tubes shall be stranded over the original core to form a two layer core. A water blocking tape shall be applied longitudinally over both the inner and outer layer with each being held in place with a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter.

14. The cable shall contain at least one ripcord under the sheath for easy sheath removal of all-dielectric cable. The cable shall contain at least one ripcord under the inner sheath and under the steel armor for armored cable. The ripcord color shall be orange for non-armored sheaths and red for armored sheaths.

15. Tensile strength shall be provided by dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.

16. OFNP listed type jacket material. The jacket or sheath shall be free of holes, splits, and blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. The jacket shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

17. The plenum rated cables shall be aluminum interlocking armor. The interlocking armor shall be covered with a flame retardant PVC outer jacket. Cables with interlocking armor shall be available in fiber counts up to 288 fibers.

18. Cable jackets shall be marked with manufacturer's name, sequential meter or foot markings, month and year, or quarter and year of manufacture, and a telecommunication handset symbol, as required by Section 350G of the National Electrical Safety Code (NESC). The actual length of the cable shall be within -0/+1% of the length markings. The print color shall be white, with the exception that cable jackets containing one or more coextruded white stripes shall be printed in light blue. The height of the marking shall be approximately 2.5 mm.

F. General Cable Performance Specifications

1. When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation at extreme operational temperatures (-40 °C and +70°C) shall not exceed 0.2 dB/km at 1550 nm for single-mode fiber and 0.5 dB/km at 1300 nm for multimode fiber.

2. When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable." a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for one hour without leakage through the open cable end.

3. When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable", the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 80°C.

4. When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 440 N/cm (250 lbf/in) for armored cables and 220 N/cm (125 lbf/in) for non-armored cables applied uniformly over the length of the sample. The load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for ten minutes. The change in attenuation shall not exceed 0.4 dB during loading at 1550 nm for single-mode fiber and 1.0 dB during loading at 1300 nm for multimode fiber. The repeatability of the measurement system is typically ± 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after load removal.

5. When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The change in attenuation shall not exceed 0.1 dB at 1550 nm for single-mode fiber and 0.3 dB at 1300 nm for multimode fiber.

6. When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," the cable shall withstand 25 impact cycles. The change in attenuation shall not exceed 0.2 dB at 1550 nm for single-mode fiber and 0.3 dB at 1300 nm for multimode fiber.

7. When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," using a maximum mandrel and sheave diameter of 560 mm, the cable shall withstand a tensile load of 2700 N (608 lbf). The change in attenuation shall not exceed 0.2 dB during loading and 0.1 dB after loading at 1550 nm for single-mode fiber and 0.5 dB during loading and 0.2 dB after loading at 1300 nm for multimode fiber.

8. When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 4 meters shall withstand 10 cycles of mechanical twisting. The change in attenuation shall not exceed 0.1 dB at 1550 nm for single-mode fiber and 0.2 dB at 1300 nm for multimode fiber.

9. When tested in accordance with FOTP-181, "Lightning Damage Susceptibility Test for Optic Cables with Metallic Components," the cable shall withstand a simulated lightning strike with a peak value of the current pulse equal to 105 kA without loss of fiber continuity. A damped oscillatory test current shall be used with a maximum time-to-peak value of 15 μs (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 30 kHz. The time to half-value of the waveform envelope shall be from 40 - 70 μs.

10. When tested in accordance with FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable", the cable shall withstand four full turns around a mandrel of ≤ 10 times the cable diameter for non-armored cables and ≤ 20 times the cable diameter for armored cables after conditioning for four hours at test temperatures of -30°C and +60°C. Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears or other openings. Optical continuity shall be maintained throughout the test."

11. All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel.

G. Design Make: Indoor/outdoor plenum cable shall be Corning FREEDM Loose tube Multi-mode (OM4) part number - XXXTSP-T4190DA3 and Single-mode (OS2) part number - XXXESP-T4101DA3. Where XXX represents the cable fiber count.

2.11 OPTICAL FIBER PATCH CABLES

A. Single-Mode fiber patch cables

1. 2.0 mm leg diameter

2. Ferrule Material Ceramic

3. Insertion Loss, Typical 0.5 dB

4. Outer Jacket Material Riser (OFNR)

5. Fiber Core Diameter 9 μm bend-improved SM (OS2)

6. Outer Jacket Color – Yellow

7. Tight-Buffered; Qty. 2 optical fibers

8. Connector Type LC duplex

9. Design Make: Corning 444402U511200XM. Where X represents the cable length.

B. OM4 Multi-Mode fiber patch cables

1. 1.6 mm leg diameter

2. Ferrule Material Ceramic

3. Insertion Loss 0.35 dB

4. Outer Jacket Material Riser (OFNR)

5. Bend-improved 50 μm MM (OM4)

6. Outer Jacket Color – Aqua

7. Tight-Buffered; Qty. 2 optical fibers

8. Connector Type LC duplex

9. Design Make: Corning 050502T511600XM. Where X represents the cable length.

2.12 OPTICAL FIBER CONNECTORS

A. Backbone optical fiber connectors: OM3/OM4 compatible LC type for Multi-mode and OS2 LC type for Single-mode

B. The terminations shall comply with the following standards:

1. EIA/TIA-4750000B Generic Specifications for Fiber Optic Connectors

2. EIA/TIA-455-AStandard Test Procedures for Optical Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components (FOTPs)

3. TIA/EIA-604-10 Fiber Optic Connector Intermateability Standard, (Type LC)

C. Connector Characteristics.

1. Strain relief: The connector shall provide a strain relief mechanism for installation on a single fiber cable that contains strength elements. The fiber within the body of the connector shall be isolated mechanically from cable tension, bending and twisting.

2. Intermateability: The connector shall be designed in compliance with the appropriate TIA FOCIS document.

3. Installation rate: The connector shall be installable on 900 μm buffered fiber in 1 minute or less total time.

4. Installation polishing: The connector shall not require polishing of the endface in the field. Connectors shall have a factory-polished fiber stub in the connector ferrule.

5. Installation type: The connector installation shall not require the use of epoxies.

6. Fiber protection: The connector crimp-on mechanism shall protect the bare fiber from the ingress of air or waterborne contaminants and shall secure the fiber in the ferrule micro-hole.

D. Performance Requirements

Multimode Testing		**Max delta change**	**Final Measurement**
FOTP-171 METHOD B1	METHOD B1 REQ.: <.75dB	N/A	0.11 dB TYP 0.19 dB MAX
FOTP 107	RETURN LOSS REQ.: <-20dB	N/A	-42.5 dB TYP -36.3 dB MIN
FOTP-2	IMPACT 8 DROPS/ 1.5 M	N/A	0.14 dB IL -41.3 dB RL
FOTP-1	FLEX 0.5 KG	N/A	0.18 dB IL -41.3 dB RL
FOTP-36	TWIST 15 N AT 0 º	N/A	0.20 dB IL -41.2 dB RL
FOTP-6	CABLE RETENTION 66 N AT 0 º	0.06 dB	0.20 dB IL -41.2 dB RL
FOTP-6	CABLE RETENTION 19.4 N AT 90 º	0.06 dB	0.19 dB IL -41.2 dB RL
FOTP-185	COUPLING MECH 33 N AT 0 º	N/A	0.13 dB IL -41.5 dB RL
FOTP-21	DURABILITY 500 CYCLES	N/A	dB IL -36.3 dB RL
FOTP-4	TEMP LIFE 60ºC/ 14 DAYS	0.01 dB	0.08 dB IL -39.0 dB RL
FOTP-5	HUMIDITY 4 DAYS @ 95%	0.15 dB	.09 dB IL -38.9 dB RL
FOTP-188	LOW TEMP. -10 ºC/4 DAYS	0.22 dB	0.13 dB IL -42.3 dB RL
Single Mode Testing		**Max delta change**	**Final Measurement**
FOTP-171 METHOD B1	INSERTION LOSS	N/A	dB TYP 0.52 dB MAX
FOTP 107	RETURN LOSS	N/A	-44.4 dB TYP -36.2 dB MIN
FOTP-2	IMPACT 8 DROPS/ 1.5 M	N/A	dB IL -40.6 dB RL
FOTP-1	FLEX 0.5 KG	N/A	0.40 dB IL -40.1 dB RL
FOTP-36	TWIST 15 N AT 0 º	N/A	0.37 dB IL -40.2 dB RL
FOTP-6	CABLE RETENTION	0.20 dB	0.39 dB IL

Multimode Testing		Max delta change	Final Measurement
	66 N AT 90 º		-42.3 dB RL
FOTP-6	CABLE RETENTION 19.4 N AT 90 º	0.11 dB	0.34 dB IL -43.2 dB RL
FOTP-185	COUPLING MECH 33 N AT 0 º	N/A	0.37 dB IL -45.0 dB RL
FOTP-21	DURA-BILITY 500 CYCLES	N/A	0.35 dB IL -40.5 dB RL
FOTP-4	TEMP LIFE 60ºC/ 14 DAYS	0.24 dB	0.29 dB IL -44.2 dB RL
FOTP-5	HUMIDITY 4 DAYS @95%	0.10 dB	0.30 dB IL -43.9 dB RL
FOTP-188	LOW TEMP. -10 ºC	0.18 dB	0.29 dB IL -44.1 dB RL

E. Design Make: The fiber optic connector shall be Corning UniCam connector with LC multimode (OM4) part number - 95-050-99-X and single mode (OS2) part number - 95-200-99; SC multimode (OM4) part number - 95-050-41-X and singlemode (OS2) part number - 95-200-41 or equivalent. Termination of Loose tube cable fiber shall require the use of Corning indoor Fanout kit part number - FAN-BT25-12 and outdoor fanout kit part number - FAN-OD25-12 or equivalent.

2.13 OPTICAL FIBER TESTING EQUIPMENT

A. Multi-mode optical fiber light source

1. Provide 850nm and 1300nm +/- 20 nm wavelength LED light sources.

2. Spectral width of sources shall be </= 50nm for 850nm wavelengths and </= 140nm for 1300nm wavelengths.

3. The output of the light source shall be 8 MW for 50um core optical fiber.

4. Output Stability +/- 0.40 dB from 0 to 50 degrees C.

5. Long Term output stability +/- 0.10dB at 25 degrees C.

6. Power shall be from rechargeable Ni-Cad batteries.

7. Connector types shall include: LC, ST and SC.

8. Design make: Siecor Light source.

9. Acceptable Manufacturers:

    a. Fluke

    b. Wavetek

    c. Lantek

B. Single-mode optical fiber light source

1. Provide 1300nm and 1500nm +/- 20 nm wavelength Laser light sources.

2. Output Stability +/- 0.40 dB from 0 to 50 degrees C.

3. Long Term output stability +/- 0.10dB at 25 degrees C.

4. Power shall be from rechargeable Ni-Cad batteries.

5. Connector types shall include: SMA, FC, ST and SC.

6. Design Make: Siecor OS-200D.

7. Acceptable Manufacturers:

    a. Fluke

    b. Meson

C. Power Meter

1. Provide 850nm, 1300nm and 1500nm +/- 20 nm wavelength test capability.

2. Measurement range shall be from 10 to -60 dBm.

3. Accuracy shall be +/- 5% at 0 to -50dBm and +/- 10% 10 to 0dBm and -50 to-60 dBm.

4. Resolution shall be 0.1 dB.

5. Connector types shall include: LC, ST and SC.

6. Design make: Siecor OM-100F.

7. Acceptable Manufacturers:

    a. Fluke

    b. Meson

2.14 FUSION SPLICING

A. Fiber splicing techniques shall be conducted in such a manner that the cores of the fibers to be spliced will be aligned as perfectly as possible to allow maximum light transmission from one fiber to the next. Without proper alignment or nonidentical core diameters, light will leave the fiber core and travel through the fiber cladding. Light outside the fiber core is not a usable light signal and is not acceptable.

B. The cable manufacturer's recommendations concerning pulling tensions and bending radius shall be followed.

C. Fiber optic splices shall be made in areas where temperature, humidity, and cleanliness can be controlled. Fusion splicing techniques shall require a splicing vehicle equipped with a work station that will allow environmental control.

D. Clean all cable coatings and fibers to fusion splicing equipment manufacturer’s recommendations.

E. The average fusion splice loss shall not exceed 0.2 dB for both single and multi-mode fibers. The average splice loss is defined as the summation of the loss as measured in both directions using an optical time domain reflectometer (OTDR) through the fusion splice divided by two.

F. Protective pig-tail splicing kits inside fiber optic patch panels with integrate adapters.

G. Cleaving tools shall be clean and have sharp cutting edges to minimize fiber scratches and improper cleave angles. Cleaving tools that are recommended by the manufacturer of the splicing system shall be used.

H. Design Make: Same as optical fiber manufacturer

2.15 AUDIO/VIDEO (A/V) CABLING AND ACCESSORIES

A. All interconnect audio and video cabling and patch cabling shall be high-resolution shielded type.

B. Audio and video cabling lengths are to be field measured unless otherwise listed.

C. All balanced audio cabling shall be STP type.

D. All full-length cables between active components shall have factory pre-terminated connectors. Field verify cable terminations requirements i.e. (male/male) or (male/female).

E. 3.5 mm Stereo Audio Cables

1. mini stereo jack male connectors on both ends of cable

2. same length as cooresponding video cable

3. Design Make: Extron 26-571-05 or Approved Equal

4. Bandwidth - 120 MHz @ 50', -3dB, w/.7 Vp-p signal

5. .24" diameter

6. Design Make: Extron IN8600P series or Approved Equal

F. HDMI Cabling

1. 4K verified up to 50 feet (15.2 m)

2. 1080p/60 verified up to 200 feet (60 m)

3. Cables up to 50-feet: Supports 4K @ 30 Hz (4096 x 2160), UHD @ 30 Hz (3840 x 2160), and 1080p @ 60 Hz signals, Data rates to 10.2 Gbps, Color depth up to 48 bits - 16 bits per color.

4. Cables up over 75-feet: Exceeds HDMI Standard Speed Cable Specifications, Supports signals up to 1080p @ 60 Hz, 8-bit color depth, Data rates to 4.95 Gbps, Color depth to 24 bits - 8 bits per color.

5. Include required HMDI active equalizer for all cable lengths over 75-feet. Equalizer shall Extends HDMI signals over HDMI cable up to 200 feet, selve powered for cables 125-feet or less. Prove with 120V:12VDC power adapter. HMDI input and output ports.

6. Design Make: Extron HDMI Pro Series w/ HDMI 101 Plus equalizer or Approved Equal

G. USB Cable (3 Meters or Less)

1. Carries USB 3.0 data signals and power; Backwards compliant with high speed USB 2.0 devices (480 Mbps).

2. 3 Meter max. length

3. Up to 4.8 Gbps bandwidth

4. Shielded to protect from interference

5. Black PVC jacket

6. Wall Plate to Wall Plate Connector Types: USB Type A to USB Type A

7. Patch Cable Connector Types for source to peripheral: USB Type A to USB Type B

8. Design Make: Legrand C2G 81XXX Series or Approved Equal

H. USB 2.0 Cable (Up to 75-feet)

1. USB 3.0 extension self-powered active Type Repeater only; not backwards compatible with USB 2.0/1.1

2. Up to 4.8 Gbps bandwidth

3. Shielded optical conversion to protect from interference

4. Black PVC jacket

5. Wall Plate to Wall Plate Connector Types: USB Type A to USB Type A

6. Design Make: Legrand Vaddio 440-1005-XXX Series or Approved Equal

I. USB 3.0 Cable (Up to 75-feet)

1. USB 3.0 extension self-powered active Type Repeater only; not backwards compatible with USB 2.0/1.1

2. Up to 4.8 Gbps bandwidth

3. Shielded optical conversion to protect from interference

4. Black PVC jacket

5. Connector Types for source to peripheral: USB Type A to USB Type B

6. Design Make: Legrand Vaddio 440-1005-XXX Series or Approved Equal

J. Speaker Cable

1. 2 conductor twisted, No. 14 AWG stranded copper

2. Design Make: West Penn Wire Corporation, No. 226

K. Provide Multimedia A/V outlet for all locations shown on the drawings.

1. Provide barrel type jacks for connecting all pre-terminated cable.

2. Provide solder type jacks for audio cable or where bulk cable is required.

3. Wall plates shall be designed for standard 1-gang backbox mounting.

4. The wall plates shall accept the following A/V modules and jacks.

a. Type F coaxial

b. 3.5mm mini stereo jack

c. BNC

d. 3-pin and 4-pin XLR

e. HDMI

f. USB Type A

2.16 ANALOG SPEAKER CABLING

A. Cable shall be ASTM tinned copper, 18 AWG (7x26 stranded), Shielded Twisted Pair (STP). Pair counts as required by manufacturer.

B. 300 Volt insulation, plenum rated.

C. Aluminum foil shield with tinned copper drain wire.

D. Cable shall be UL listed NEC type CMP, constructed in accordance with UL 444.

E. Cable shall be fully functional from -10°C to 60°C.

F. Design Make: West Penn or Approved Equal

2.17 ACCESS CONTROL STP CABLING

A. Aluminum foil shield with tinned copper drain wire.

B. Cable shall be UL listed NEC type CMP, constructed in accordance with UL 444. Plenum Rated

C. RS485 Network Wiring: RS-485 standard compliant, up to 4000 feet (1200 m), 22-24 AWG Tinned Copper, FEP (Tefon) insulation, Impedance: 100-120 Ohms Capacitance: 12-16pf/f.

D. Reader Wiring: 3-Pair 22 AWG Shielded

E. Design Make: West Penn or Approved Equal

2.18 LABELING

A. All labels shall be typed on self-adhesive label strips where a plastic protector is not present on the termination equipment.

B. All letters and numbers shall be capital and the same font, black colored text on white background, closest to size 12 ARIAL FONT as possible.

C. Label maker Design Make: DYMO or Approved Equal.

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Horizontal Cable Runs:

1. All interior cabling shall be installed concealed inside the wall cavities and ceiling space.

2. Provide a continuous raceway system in accordance with NEC Article 800 for horizontal cable runs through all inaccessible ceiling (including drywall) and wall cavity spaces. All flexible raceway system runs shall be securely attached to ceiling joists and wall studs 3-feet O.C and removal and addition of cables in the future.

3. UTP Cables shall be supported by Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray zip-tie to cable tray away from STP, coaxial cables, and optical fiber cables. Provide additional stacked Cable Hangers when filled greater than 50%.

4. STP Cables shall be supported by Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray zip-tie to cable tray away from horizontal cables, coaxial cables, and optical fiber cables. Provide separate dedicated Cable Hangers for all STP and Access Control Cabling.

5. In finished locations provide surface raceway for cabling installations from ceiling down to outlet or device where cabling cannot be concealed in construction. Provide conduit to outlet and devices for all exposed no-finished installations in mechanical rooms, gymnasiums, auditoriums, and rooms without accessible ceilings from Cable Hangers and Cable Tray.

6. Refer to specification section 260533 – Raceways for maximum cable fill and supporting hardware specifications.

7. Where larger cable quantities are required to share a single raceway refer to EIA/TIA-569 Conduit Sizing Table 4.4-1.

8. All new device outlets in finished areas shall be flush mounted in the walls.

9. Provide surface raceway for all wiring installations in unfinished areas and conduit for all areas with no ceiling open to the structure.

10. All exterior cabling shall be run in direct buried conduit.

11. Provide separate pathways for all control, video, and signal wiring from 120V branch circuiting.

12. Provide all sleeves as required for routing of cables.

13. Provide firestopping at all firewall and floor penetrations.

14. Do not untwist Cat. 6 cable pairs more than 0.5 in. when terminating.

15. Provided inner duct as required to route A/V signal cabling in plenum ceiling spaces. Inner duct shall be 1 ½” diameter, plenum rated, and have pull tape. Design Make: Carlon CH4X1C-350.

16. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

17. Install cable in neat and workmanlike manner. Neatly bundle and tie all cable in at terminations.

18. Maintain the following clearances from EMI sources.

    a. Power cable - 6 in.

    b. Fluorescent Lights - 12 in.

    c. Transformers - 36 in.

19. Do not install with more than 110N pull force.

3.2 AUDIO/VIDEO CABLING AND ACCESSORIES

A. Provide all required patch cables not shown on the drawings to interface equipment specified in this section.

B. Provide 2'x2' projector plate with extension column above ceiling mount projector location. Prior to rough-in coordinate distance off projector screen or SmartBoard based on the selected projector throw. Independently support the projector plate with support wires to structure above drop ceiling.

C. Cut 2'x4' acoustical ceiling tiles to fit the 2'x2' projector plate. General contractor shall furnish 2' t-bar ceiling accessible bracket to support the half tile and unsupported end of the projector plate.

D. Hang projector from projector plate. Install 120V duplex receptacle flush in knockout in plate. A/V wiring may be run directly to projector and concealed inside 1 ½" pipe column from ceiling down to projector.

E. Connect A/V wiring and power cord to projector.

3.3 OPTICAL FIBER CABLE

A. General

1. Interior cable shall be installed completely inside UL listed innerduct or integral concentric metallic jacket.

2. Innerduct and fiber cables shall be supported by Cable Hangers 3-foot on center or in Cable Tray. When installed in cable tray zip-tie to cable tray away from horizontal cables.

3. Install the cable and innerduct assembly as close to the ceiling deck as possible in a segregated pathway. Do not install with UTP or coax cables.

4. Provide tie wraps to close top of cable hangers after installation is complete.

5. Exterior cable shall be installed in one of the following methods:

    a. Underground ductbank

b. Metallic conduit for installations more than 50 feet inside building in accordance with NEC Article 770 and 800.

B. Maintain polarization for entire system as described in ANSI/EIA/TIA-568-A section 12.7.1.

C. Cable shall be continuous. Splices are not allowed except where fusion splicing is called for in the documents.

1. Cable Pulling

a. Adhere to all manufacturer's requirements regarding pulling tension, allowable lubricants and bending radius.

b. Provide cable pullers designed to suit field conditions. (i.e. horizontal vault pulls, vertical pulls and 45 degree pulls).

c. Use cable guides with aluminum adapters sized for the 1 ¼" cells. Provide extensions, sheaves and adapters as required by the installation conditions.

d. Use directional pulling swivels as conditions require.

e. Use Line Tension meter during cable pull to provide accurate measurements of the force exerted on a cable as it is installed. The meter shall have a programmable overload set point with an audible and visual indication of an overload condition. The meter shall have controls to disengage the cable puller if an overload occurs. Provide chart recorded documentation of the cable pull for the Owner's records.

f. Provide cable rack supports in all manholes with 10-feet service loop.

3.4 UTP CABLE TESTING

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of each applicable ANSI/TIA/EIA section listed above for each cable type.

2. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

3. The testing parameters called for in this section shall apply for up to 90 meters of horizontal cable, a work area equipment cord, an RJ45 outlet and 2 cross connect connections in the closet.

4. The test parameters shall include Wire Map, Length (report only), Attenuation and NEXT.

5. Wire Map - The wire map test shall verify pair to pin termination at each end and check for connectivity errors. The wire map shall indicate the following for each of the eight conductors:

   a. Continuity to the remote end

   b. Shorts between any two or more conductors

   c. Crossed pairs

   d. Reversed Pairs

   e. Split Pairs

   f. Any other miswiring

6. Attenuation - The link attenuation and NEXT of all cables shall be tested. The link is the sum of the attenuation of all connecting hardware, patch and equipment cords, and cable. The following tables indicate the acceptable values:

Attenuation			
Frequency (MHz)	**Category 3 (dB)**	**Category 5e/6 (dB)**	**Category 6A (dB)**
1.0	3.2	2.0	2.1
4.0	6.1	4.1	3.8
10.0	10.0	6.5	5.9
16.0	13.2	8.2	7.5
20.0	-	9.3	8.4
31.25	-	11.7	10.5
62.5	-	17.0	15.0
100.0	-	22.0	19.1
155	-	28.1	24.1
200	-	32.4	27.6
300	-	41.0	34.3
350	-	44.9	37.2
400	-	-	40.1
500	-	-	45.3
625	-	-	51.2

PS Next (worst pair to pair)			
Frequency (MHz)	**Category 3 (dB)**	**Category 5e/6 (dB)**	**Category 6A (dB)**
1.0	40.1	70.3	73.3
4.0	30.7	61.2	64.3
10.0	24.3	55.3	58.3
16.0	21.0	52.2	55.2
20.0	-	50.7	53.8
31.25	-	47.8	50.9
62.5	-	43.3	46.4
100.0	-	40.3	43.3
155	-	37.4	40.4
200	-	35.7	38.8
300	-	33.1	36.1
350	-	32.1	35.1
400	-	-	34.3
500	-	-	32.8
625	-	-	31.4

B. Data reporting and accuracy

1. General: a Pass or Fail result for each parameter shall be determined by the allowable limits for each parameter. If the test result of a parameter is closer to the test limit than the accuracy of the tester it shall be marked with an asterisk. Data at all measured points shall be uploaded to a P.C. and printed on a laser printer.

2. Wire Map: Wire map tests shall be marked “Pass” if wiring is determined correct.

3. Length: Test results shall be reported in meters.

4. Attenuation: Report the attenuation value and the frequency at point of failure or the highest frequency passed. Measured attenuation values lower than 3dB used for a pass/fail determination. Report the attenuation per unit length for links longer than 15 meters. Attenuation shall be measured from 1 MHz to 16 Mhz (Category 3) or 350 Mhz (Category 5e/6) or 500 MHz (Category 6A) in the steps listed in the tables above.

5. NEXT: Report the NEXT value and “pass or fail” for samples based on the following:

Frequency Range (MHz)	**Maximum Step Size (MHz)**
1-31.35	0.15
>31.25-100	0.25

C. Submit copies in binder format and 4 copies on compact disks containing all summary reports, full plot data test results, tester software tools required to view and inspect and print any selection of the test reports, spreadsheets, end to end reports and as built drawings called for at the completion of job.

3.5 OPTICAL FIBER CABLE TESTING

A. Backbone Cable

1. Test the cable on the reel for continuity before installing it, to insure no damage was done in shipment from the manufacturer to the job site.

2. After installation and termination, test each segment of the cable plant individually as it is installed, to insure each connector and cable is good.

3. Link attenuation is the only required field test except for the patched runs in the campus backbone system where an OTDR test will be required. Use launch cables at each end and provide print outs showing all connectors. OTDR will also be required to determine bad connections or damage when the link attenuation test fails.

4. Maximum localized attenuation allowed is 2dB.

5. Backbone multimode fiber shall be tested in one direction at both 850nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A method B.

6. Backbone single mode fiber shall be tested in one direction at both 1310nm and 1550 nm in accordance with ANSI/EIA/TIA-526-14A method A.1.

7. Multimode fiber shall conform to the following:

850 nm: Length (meters)	Attenuation (dB)
500	3.5
1000	5.5
1500	7.5
2000	9.0

1300 nm: Length (meters)	Attenuation (dB)
500	2.2
1000	3.0
1500	3.8
2000	4.5

8. Single Mode Fiber shall conform to the following (note: taken at 1550nm)

Inside:

Length (meters)	Attenuation (dB)
500	2.0
1000	2.5
1500	3.0
2000	3.5
2500	4.0
3000	4.5

Outside:

Length (meters)	Attenuation (dB)
500	1.8
1000	2.0
1500	2.2
2000	2.5
2500	2.8
3000	3.0

B. Documentation

1. Provide attenuation and cable length test results for all installed cable pairs.

3.6 LABELING

A. Label each and every termination port for all new cables.

B. Label all new patch panels.

C. Label all new Racks and Cabinets with the CER, Wiring Closet, MDF, or IDF name.

D. UTP Cabling

1. Jack or Outlet termination - All labels shall be typed indicating the CER, Patch Panel Name, and Port Number. Example for CER A, Patch Panel B, port 11: “AB11”.

2. Wiring Closet, Data Closet, MDF, or IDF termination: Label all termination ports with [Room Number]-[Cable Number]. Examples “128-01”, “128-02”, etc. If the cable is run to equipment such as a Fire Alarm Panel or Public Address System label it as [Room Number]-[Equipment Name].

3. Label all Patch Panels in order of top to bottom starting with A.

4. If the UTP cable is run to a separate building, label the UTP Patch Panel with the Building Name in addition to the Patch Panel Name.

E. Optical Fiber Cabling

1. Originating Patch Panel - All labels shall be typed indicating the Destination CER, Fiber Type [MM or SM], and Port Number.

2. Destination Patch Panel - All labels shall be typed indicating the Originating CER, Fiber Type [MM or SM], and Port Number.

3. Label all Patch Panels in order of top to bottom starting with A.

4. If the optical fiber optic cable is run to a separate building, label the Optical Fiber Patch Panel with the Building Name in addition to the Patch Panel Name.

END OF SECTION 271000

SECTION 271100 - COMMUNICATION EQUIPMENT ROOMS AND SPACES

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

B. This section includes the minimum requirements for equipment and cable installations in Communication Equipment Rooms (CERs). The following equipment is described in this section:

1. Floor Mounted Racks
2. Wall Mounted Cabinets
3. Floor Mounted Cabinets
4. Power Strips
5. Equipment Shelves
6. Cable Management
7. Fiber Patch Panels
8. UTP Patch Panels
9. Telecom Ground Bar (TGB) - Grounding And Bonding
10. Backboards
11. Cable Hangers and Supports
12. Hook and Loop Wraps
13. Ladder Rack
14. UPS Units
15. Labeling

1.2 QUALITY ASSURANCE

A. All equipment rooms shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owners representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.

B. Materials and work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA-568B.x
2. NECA/BICSI 568-2001
3. ANSI/TIA/EIA-569A –x
4. ANSI/TIA/EIA-606-A
5. TIA/EIA-607
6. Underwriters Laboratory
7. Federal Communications Commission
8. NFPA 70 – latest version of the National Electric Code

1.3 SUBMITTALS

A. Provide product data for the following:

1. Equipment Racks & Cabinets
2. Power Strips
3. Equipment Shelves
4. Cable Management
5. Fiber Patch Panels
6. UTP Patch Panels
7. Telecom Ground Bar (TGB) - Grounding And Bonding
8. Cable Hangers and Supports
9. Ladder Rack
10. UPS Units

2.0 PART 2 - PRODUCTS

2.1 MANUFACTURER REQUIREMENTS

A. Provide an end-to-end connectivity solution in which all UTP Patch Panels and horizontal cabling connecting hardware are made by the same manufacturer, except for equipment cabinets, racks, and fiber patch panels. Refer to specification section 271000 for additional information regarding horizontal cable connectivity.

2.2 FLOOR MOUNTED RACKS

A. Racks shall meet the following physical specifications:

1. 19” rack mounting space.

2. 7 foot high.

3. Lightweight aluminum construction.

4. Black polyurethane finish.

5. 15” deep base with four (4) ¾” bolt down holes.

B. Rack shall have double sided 12/24 tapped holes and 5/8”,5/8”, ½” standard EIA hole pattern.

C. Power strip with (6) surge protected outlets, meeting U.L. 1363 and 1449-second addition requirements, mounted on the rack.

D. Acceptable Manufacturers:

1. Hoffman

2. Hubbell

3. Chatsworth

4. Panduit

2.3 WALL MOUNTED EQUIPMENT CABINETS

A. Wall mounted, fully enclosed metal construction, black finish.

B. Fully perforated steel front and rear doors for air-flow, lockable same keyed doors, vented metal side panels.

C. Knockouts sized for 1", 2", 3" and 4" conduit and fittings located at top, bottom and rear

D. Reversible cabinet mounting design for left or right- hand swing out

E. Dimensions: 48"H x 24"W x 24"D (4’ wall cabinet) – 20U Space

F. Acceptable Manufacturers:

1. Hoffman

2. Hubbell

3. Chatsworth

4. Panduit

2.4 FLOOR MOUNT EQUIPMENT CABINET

A. Locking front/rear doors

1. All cabinets keyed alike
2. Key for front door operates front door locks only
3. Rear door master key operates both front and rear door locks

B. Vertical Cabinet Management

1. Channels for routing cable built into cabinet uprights
2. Points to tie-off cable along entire height of cabinet

C. Enclosure Construction and Doors

1. Single Front Door – 16 ga. perforated Steel
2. Split Rear door: 18 ga perforated steel
3. Removable, 18 ga. solid steel side covers
4. Roof: 18 ga. w/ 9 openings

D. Textured powder coat (Color: Black)

E. Dimensions and Physical:

1. Dimensions: 42U mounting spaces capable high x 24"W x 42"D
2. Static weight load capacity: 2,000 lbs.
3. All rails fully adjustable from front to rear from 7.5” min. to 41.25” max.
4. 19” wide rails tapped EIA-310-D

F. Equipment Cabinet to include the following features and accessories:

1. (50) matching screws for equipment mounting
2. (50) matching cage nuts
3. 6-outlet surge suppressed power strip
4. (4) vertical 0U PDU accessory rails in rear of cabinet

G. Acceptable Manufacturers:

1. Hoffman

2. Hubbell

3. Chatsworth

4. Panduit

2.5 EQUIPMENT SHELVES

A. Equipment shelves shall be made of heavy gauge steel rated for 150 pound capacity.

B. Shall be rack mountable center weighted with mounting brackets as required for the installation.

C. Design Make: Belden 9011-1918

D. Acceptable manufacturers:

1. Hoffman

2. Hubbell

3. Chatsworth

4. Panduit

2.6 6-OUTLET RACK MOUNT POWER STRIP

A. 19” rack mountable, 1U

B. 6-surge protected 5-15R outlets

C. Internal circuit breaker

D. 7’, 120V cord

E. Design Make: Tripp-Lite or Approved Equal

2.7 CABLE MANAGEMENT

A. Provide rack mounted horizontal and vertical cable management for all horizontal, backbone and patch cables as called for on the drawings.

B. Panels shall have front and back channels with hinged or removable covers.

C. Cable management panels shall be plastic with plastic or metal hinged covers and have integral wire retaining fingers. The wire retaining fingers shall be spaced and designed to accommodate Cat. 6A cabling.

D. Vertical cable manager – 6”W x 84”H x 16”D w/ dual hinged door on front, none on rear. Include center divider with cable pass thru openings.

E. Horizontal cable manager- 2U high, front and rear mounting to rails, 3.5"H x 19.0"W x 13.1"D

F. Management panels shall mount to any standard 19” rack and include all required mounting brackets and screws.

G. Design Make: Vertical Cable Manger

H. Design Make: Horizontal Cable Manger

I. Acceptable manufacturers:

1. Belden
2. Panduit
3. Hubbell
4. Leviton

2.8 FIBER PATCH PANELS

A. Shall be wall or rack mounted as called for on drawings.

B. Shall include factory installed rounded rubber grommet and plastic protected radius side openings behind front cover to protect fiber cable at all entry and exit points.

C. The patch panel shall utilize a single mounting footprint and shall be interchangeable between the rack and wall mountable hardware used.

D. Clear Plexiglas front hinged cover on rack mount models.

E. The panel shall be attached with two push-pull latches to allow quick installation and removal.

F. The adapter panel shall be available with industry standard single fiber and small form factor multi-fiber adapters, including the SC duplex and LC duplex.

G. The adapter panel shall accommodate OM2 thru OM4, and OS2 optical fiber.

H. Panels shall be manufactured from injection molded polycarbonate for structural integrity.

I. General Specifications

1. Fiber Optic housings shall provide a means for securing, strain-relieving, protecting, and labeling of fiber optic cable terminations. Housings shall be available in both rack-mount and wall-mount configurations, and accept one standard adapter panel footprint for all housings.

2. All patch panels shall include integral modular removable plates to support optical fiber connector adapters.

3. Housings for rack-mounted or frame-mounted applications shall support conventional cross-connection and interconnection schemes as well as splicing applications.

4. Housings shall be available in 1U, 2U, 3U and 4U. One industry standard (EIA compliant) rack unit or panel height (denoted as 1U) is defined as being 44.45 mm (1.75“) in height in compliance with EIA-310-D (“Cabinets, Racks, Panels, and Associated Equipment”).

5. The housings shall have capacity specifications as listed below in Table.

Unit Size	Panel Capacity	Housing Fiber Capacity, using:		
		6f / panel	12f / panel	24f / panel
1U	2	12	24	48
2U	4	24	48	96
3U	6	36	72	144
4U	12	72	144	288

J. Provide duplex style single-mode and multi-mode fiber cassettes located inside housing. Provide blank cassettes in unused frame spaces.

K. Patch panels shall include integral removable splice tray drawer complete with coil rings for cable management and cable tie-down clips for support of main cable.

L. Accommodates integral pigtail splice tray kit with rounded cable coil managers.

M. Design Make: 12 fiber Adapters shall be Corning Closet Connector Housing (CCH) panel with part numbers – LC duplex multimode (OM4) - CCH-CP12-E4, LC Duplex single mode - CCH-CP12-A9 , SC duplex multimode (OM4) - CCH-CP12-E6, LC Duplex single mode - CCH-CP12-59

N. Acceptable Manufacturers: None

2.9 UTP 48-PORT PATCH PANELS

A. Shall meet or exceed all Category 6A UTP specifications outlined section 271000.

B. Terminated in accordance with T568B Pin Configuration

C. Provide only 48 port panels, in 2 RU height

D. Cable managements clips in rear.

E. Provide 5” deep cable strain relief supports in rear.

F. Rack or wall mounted as called for.

G. Unloaded type, provide (48) white 110-style termination keystone jacks with each patch panel. Each jack shall match horizontal cable category being terminated on that jack. Refer to section 271000 for 100-ohm UTP jack and termination requirements.

H. UL listed File # E129878

I. .09" thick rolled edge black anodized aluminum construction.

J. Beryllium copper with minimum 50 micro-inch gold plating.

K. Accepts keystone jacks 110 termination with tin lead plated IDC.

L. Each patch panel shall be factory labeled 1-48.

M. Acceptable Manufacturers:

1. Legrand
2. Belden
3. Hubbell
4. Panduit

2.10 BACK BOARDS

A. Shall be 4' x 8' x ¾" CDX, fire rated plywood

B. Shall be painted with gray, acrylic, interior, fire retardant paint. Manufacturer: Pratt & Lambert "Stormy Sea #2233.

C. 2"D" Rings Part numbers: Senior Industries SI-4754 shall be used for cross connects above blocks and SI-4755 for routing Category 5E cables vertical and horizontally. Owner to review in field before installation.

2.11 SPIRAL WRAP

A. Shall be constructed flame retardant polyethylene as required for organizing, protecting and identifying loose fibers in each fiber patch panel, especially where they house multiple cable sheaths.

B. Shall be a size large enough to contain all fiber strands of a given cable sheath under one wrap.

C. Shall be clear or opaque to allow visual observation through wrap without opening.

D. Shall accept ink from permanent pen markers or adhesive labels, to identify fiber number and building designators.

E. Design make: Panduit T50 series.

F. Acceptable Manufacturers:

1. Pepico

2. Ark-Plas Products.

2.12 TELECOM GROUND BAR (TGB) - GROUNDING AND BONDING

A. Each Communication Equipment Room (CER, IDF, MDF, NOC, Wiring Closet, or data Closet) shall be equipped with a telecommunications grounding bus bar (TGB). This TGB shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TGB shall be installed and bonded to the building's electrical entrance grounding facility in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.

B. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

C. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the CER shall be grounded to the respective TGB using a minimum #6 AWG stranded green jacket insulated copper bonding conductor and compression connectors at each end.

D. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and busbars shall be identified and labeled in accordance with the Testing and Administration Section of this specification.

E. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by a licensed electrical contractor.

F. TGB (Telecom Ground Bar)

1. Dimensions: ¼” thick x 2” wide x 12” long

2. Includes two h wall mount brackets with insulators

3. (18) 3/8” Hole Sets

G. Design Make: Harger Erico EGBA14212GG or Approved Equal

2.13 HOOK AND LOOP WRAPS

A. Provide hook and loop strip wraps, in a minimum of 1.5” wide for dressing out, bundling and support UTP, fiber, coaxial cables in CER’s, in cable trays, in J-hook, on ladder racks, in racks and cabinets and in horizontal pathways.

B. Provide hook and loop wraps on 4’ centers in all CER’s.

C. Do not use tie-wraps to bundle and secure UTP, coaxial or fiber cables.

D. Provide UL Listed Hook & Loop Cable Ties for use in Air Handling Spaces

E. Design Makes: Panduit HLSP1.5S Series for air handling spaces Panduit HLT, HLS and HLS-15R for other environments

F. Acceptable Manufacturers:

1. Leviton Soft Cinch

2. Panduit

2.14 WALL MOUNTED CABLE SUPPORTS

A. Provide wall mounted “D” rings for wall mounted vertical and horizontal cable management.

B. Design Make: Senior Industries -SI-4754 - cross connect wiring, SI-4755 Vertical and Horizontal Category 6 cable.

C. Acceptable manufacturers:

1. Allen Tel

2. Panduit

2.15 LADDER RACK

A. Provide 9”, 12” and 15” wide cable rack as shown on CER plans and as required to suit field conditions.

B. Include connecting and support hardware to suit the installation.

C. Rack shall solid side bar nominally 3/8” thick by 1 ½” high. Provide rungs 9” on center.

D. Provide with waterfall fittings for all cable drops from ladder rack.

E. Provide grounding strap accessory.

F. Side bars shall be painted gray.

G. Design Make: Belden

H. Acceptable manufacturers:

1. Newton

2. Homaco

2.16 UPS UNITS

A. 2200VA UPS UNIT

1. Output power capacity 1,800 Watts / 2,200 VA
2. Double conversion on-line power, pure sine wave output
3. Maintenance-free sealed Lead-Acid battery
4. 3-minute run time full load, 10-minute runtime on half load
5. Input: NEMA 5-20P on 6-foot cord
6. Output: (6) NEMA 5-20R receptacles
7. Monitoring and shut-down Interface Ports: RJ-45 10/100 Base-T & USB
8. Includes rack mount rails
9. 2U high
10. Design Make: APC SRT2200RMXLA
11. Acceptable Manufacturers: Emerson or Tripp-lite

B. 3000VA UPS UNIT

1. Output power capacity 2,100 Watts / 3,000 VA
2. Double conversion on-line power, pure sine wave output
3. Maintenance-free sealed Lead-Acid battery
4. 12-minute run time full load, 30-minute runtime on half load
5. Input: NEMA L5-30P on 8-foot cord
6. Output: (6) NEMA 5-15R receptacles + (2) 5-20R
7. Monitoring and shut-down Interface Ports: RJ-45 10/100 Base-T & USB
8. Includes rack mount rails
9. 2U high
10. Design Make: APC SRT3000RMXLA
11. Acceptable Manufacturers: Emerson or Tripp-lite

2.17 LABELING

A. All labels shall be typed on self-adhesive label strips where a plastic protector is not present on the termination equipment.

B. All letters and numbers shall be capital and the same font, black colored text on white background, closest to size 12 ARIAL FONT as possible.

C. Label maker Design Make: DYMO or Approved Equal

3.0 PART 3 - EXECUTION

3.1 LABELING

A. Label horizontal all cable outlets to mirror the labeling on the patch panel at the demarc end or wiring closet end. Label all telephone and/or data jack to the following example:

"BA11" = B – CER B A – Patch Panel A, 11 – Patch Panel Port 11

B. Label all fiber patch panels such that each pair can be identified by fiber type (single mode or multimode), source building of fiber, and pair number per. the following example:

"SMF-MS-CERA-01" = Singlemode Fiber – To Middle School CER A - Pair 1

"MMF-HS-CERA-01" = Multimode Fiber – To High School CER A - Pair 1

3.2 FLOOR MOUNTED RACKS/CABINETS

A. All racks shall be anchored to the floor.

B. Provide vertical and horizontal cable management as called for in this section and the drawings.

C. Mount rack a minimum of 36" from wall when orientated parallel to wall and tight to wall when perpendicular to wall.

D. Ground the rack to the equipment ground bar with a #6 copper wire.

E. Provide (1) rack mount shelf and power strip for each new rack or cabinet.

F. Label racks and cabinets for each CER designation on plastic engraved label.

3.3 WALL MOUNTED RACKS

A. Secure wall mounted racks to building structure with approved anchoring means

B. Verify all existing wall construction and submit proposed anchoring methods for approval.

C. Provide (1) rack mount shelf and power strip for each new rack or cabinet.

D. Provide vertical and horizontal cable management as called for in this section and the drawings.

E. Label racks and cabinets for each CER designation on plastic engraved label.

3.4 CABLE MANAGEMENT

A. Provide (2) rack mounted vertical cable managers on both sides. If two or more racks are installed side by side, install vertical cable managers between the racks and cable managers on the outside or end of racks.

B. Provide one horizontal cable manager for each 48 UTP port panel and fiber patch panel installed.

3.5 CABLE SUPPORTS

A. Provide “D” rings 2 ft. on center for all exposed vertical cable runs.

B. Provide cable hangers 3 ft. on center for all exposed horizontal and backbone cable runs.

C. Keep Horizontal wall mounted cable runs to a minimum. In general horizontal runs shall be in wall mounted ladder rack.

D. Provide cable brackets 4’ on center supported to building structure for all cable runs above ceilings where cable tray is not called for.

E. Refer to specification section 260533 for additional information.

3.6 LADDER RACK

A. Provide ladder rack from sleeve entrance to CER to opposite wall, travel shall extend above rack/cabinets.

B. Secure rack to walls and to the top of the equipment racks.

C. Refer to specification section 260533 for additional information.

3.7 BACK BOARDS

A. Linear wall space used for anchoring equipment shall be lined for the full closet width with fire treated BCX grade exterior plywood 3/4" and 8' high.

B. Plywood for mounting termination equipment on shall be installed vertically side by side a minimum of 6" above finished floor. Mounting of said plywood shall be sufficient enough to support the equipment.

C. Plywood for supporting riser cables shall be installed vertically resting directly on the finished floor. Anchoring and mounting techniques of plywood used to support backbone riser cables shall be sufficient to support a minimum of 1500 pounds of weight.

D. In no cases shall the heads of mounting screws protrude past the face of the plywood.

E. Contractor shall install distribution rings for the cross-connect fields above all wall mounted blocks. Two rings per vertical row. Scorings with copper tubing cutters to eliminate ¾ of one of the mounting legs, snap off and debur. Mount rings with two hex head screws per ring.

3.8 MISCELLANEOUS REQUIREMENTS

A. Provide Ladder Rack from overhead sleeve locations in closets to equipment racks and punch down block locations.

B. Provide nylon cable ties with Velcro fastening means for organizing all patch and loose cable.

C. All cables shall be neatly “dressed out” in equipment rooms.

D. Provide all required sleeves for routing of telecom cabling sized properly for no more than 40% wire fill capacity.

E. Provide Ladder Rack from overhead sleeve locations in closets to equipment racks and punch down block locations.

F. Provide hook and loop wrap strips as the primary means for organizing all voice, data and coaxial cables in CERs.

G. All cables shall be neatly “dressed out” in equipment rooms.

H. The division 26 contractor shall provide all required sleeves, penetrations and cores for communications raceways and cabling.

I. Provide a minimum of (2) 4” EMT sleeves with nylon bushings on each end into each Communications Equipment Room.

J. Fire Stop all sleeves and conduit openings at time or removal of existing abandoned cables and again at time of cable installation, as called for.

3.9 110 PUNCH DOWN BLOCKS

A. Installed on plywood backboard so that top of block is 5’6” AFF

B. Mount Blocks with steel, zinc plated 5/16" slotted hex head #10 x 3/4" drill screws. Part # Metallics DS181.

C. Label per specifications or as directed by Engineer.

3.10 TELECOM GROUND BAR (TGB) - GROUNDING AND BONDING

A. Provide pre-drilled tin plated copper bus bar, with standard NEMA bolt hole sizing and spacing for connectors being used, in all communication equipment rooms.

B. All connectors and clamps shall be mechanical type made of silicon bronze.

C. Terminals shall be solderless compression type, copper long-barrel NEMA two bolt.

D. Provide #6 AWG conductor from the bus bar to the electrical system equipment ground.

E. Bond the ground bar in the main communication equipment room to dedicated communications equipment panelboard where applicable.

F. Bond metallic equipment racks and cabinets to the ground bar.

G. Bond the shield of shielded cable to the ground bar in communications rooms and spaces.

3.11 UTP PATCH PANELS

A. Provide rear wire manager near the top of panel.

B. Route cables from the back of patch panel through coupler openings and attach cable to the wire manager with cable ties.

C. Do not untwist cable more than 0.5 in. when terminating.

D. Locate so that combined length of cables and cords from panel to switch does not exceed 3m.

E. Label patch panels per drawings and specifications.

3.12 CLEANING

A. In all terminating spaces that have had floor or wall penetrations, hammer drilling, or core boring activities - a thorough brooming, vacuuming, and wet mopping/sponging shall be performed. Cleaning shall include floors, walls, ladder trays, tops of cabinets/racks, existing/new passive and active components, per manufacturer recommendations.

B. All non-metallic cable managers and snap covers shall be wiped clean, both inside and outside of front, including rear channels. All clear covers and doors shall be cleaned, both front and rear per manufacturer recommendations.

C. Inside of fiber optic enclosure and patch panels shall be blown clean of settled dust. Said cleaning shall be performed for all new construction projects or where gypsum sanding has been performed.

D. All scraps, boxes, spools, pull line and trash shall be removed and properly disposed of.

E. All residual cable lubricant shall be cleaned from floors and walls with an appropriate degreaser.

F. In carpeted CER rooms, thoroughly vacuum room clean.

END OF SECTION 271100

SECTION 274117 - INTEGRATED AUDIO SYSTEMS

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services required for the installation of a complete and functioning High School gymnasium sound system.

B. Provide all required cable adapters and terminations, patch cables, grounding, trouble shooting, manufacturer on-site technical support.

1.2 SEQUENCE OF OPERATION

A. Wired Audio Inputs: 3-pin XLR and 3.5mm stereo jacks and wiring from the wall plate on the rack wired to the mixer in the equipment cabinet.

B. Wireless Capabilities: Reconnect the output from the wireless microphone system wired to the mixer in the equipment cabinet.

C. The amplifiers shall be normally powered off. For any operation they shall be manually turned on.

D. Speakers are patched in to the outdoor wall plate at the future bleacher location. Underground waterproof wiring from wall plate to the fixed speakers on the light poles.

1.3 SCOPE

A. The following equipment is included as part of this section:

MULTIPURPOSE FIELD SOUND SYSTEM		
Item #	Quantity	Item
1	(1)	Wireless Microphone Receiver and Handheld Mic.
2	(1)	Automatic Mixer
3	(1)	Type A Amplifier
5	(4)	Type A Speakers
8	(1)	Mobile Protected Audio Rack
9	(1)	6-outlet surge suppressed power strip
10	Audio/Video Wall Plates & Patch Cables	As required

B. Refer to the specification section 271000 for additional horizontal cabling requirements.

1.4 SUBMITTALS

A. Provide catalog cut sheets on all equipment, devices, hardware, etc.

B. Detailed statement of scope indicating contractor, sub-contractor and equipment supplier responsibility. Include which equipment will be provided by each entity.

C. System installers manufacturers certification.

D. Submit proposed rigging design for the hanging loudspeakers prior to rough-in. Include all connecting hardware, cabling, and truss and structural attachment hardware cut sheets with live load ratings.

E. Provide shop drawings (minimum 11x17 size) each drawing shall include the drawing number, drawing name, date, Equipment Supplier or manufacturer name. The drawing set shall include as a minimum:

1. Cover Sheet / Revision Record

2. Equipment cabinet elevation showing all components.

3. Riser diagram indicating wire type and quantity required for each device type on the system. Include wire manufacturer part numbers.

4. Equipment interconnect showing where to land each conductor of all field wiring at the equipment cabinet(s). Any custom inter-cabinet wiring shall also be shown on this drawing.

1.5 QUALITY ASSURANCE

A. Equipment furnished under this specification shall be the standard product of one manufacturer with the exception of speakers and surge protection which may be the product of a different manufacturer. All components shall be fully tested and documented to upgrade as a complete system.

B. All equipment furnished under this specification must be installed by, or under the supervision of manufacturer certified personnel.

C. The system supplier shall have a service department within a 60 mile radius and respond to system problems within a 24 hour period. Suppliers shall have been in this business for a minimum of 10 years and must guarantee that spare parts shall be carried in stock for a period of 10 years.

D. All equipment necessary for proper operation of the system though not specifically specified in this section shall be deemed part of the specification.

E. All required maintenance or trouble calls for a period of 12 months from the date of system acceptance shall be provided at no charge to the Owner, unless damage is caused by misuse or abuse.

F. All equipment shall comply with applicable FCC regulations and be UL listed.

G. The Contractor must have completed three similar installations that are currently working satisfactorily.

2.0 PART 2 - PRODUCTS

2.1 OUTDOOR SPEAKER CONNECTOR OUTLET

A. Neutrik speakON 2-pole twist lock speaker jacks

B. speakON 1/4" combination panel mount connector, allowing the use of either twist-lock or standard 1/4" phone plug cables.

C. Connector has the same PCB footprint and panel cut out screw mount

D. Design Make: Neutrik NLJ2MD-V jacks installed 1-gang aluminum plate

2.2 OUTDOOR SPEAKER PATCH CABLES

A. 50-feet in length

B. 12g twisted pair pure copper cable

C. Robust Neutrik touring-grade connectors

D. Reliable, heavy-duty construction

E. 65-strand pure copper cable and oversized outer jacket

F. Guaranteed for life

G. Design Make: Livewire Elite Speaker Cable Series

2.3 AUDIO RACK

A. 20space (20U) tall x 20 inch deep wall mounted enclosure including rear rails and mounting bolts for your equipment.

B. Lockable hinged front and rear doors. Front door reversible and perforated.

C. Black finish steel construction

D. Front and Rear Rack Rails Included

E. Mounting bolts included

F. Design Make: Mid-Atlantic or Approved Equal

2.4 TYPE A LOUDSPEAKER

A. Ultra-compact, IP56 Weatherproof, 2-Way Full-range Loudspeaker

B. Sleek, visually appealing design. Rotationally molded shell with outstanding acoustic properties. A mildly trapezoidal cabinet offers two-axis flypoints and yoke mount points, plus a single stand mount socket on the bottom and rear inserts for a wall or pole mount. Three layer WeatherTech™ grill protects the also weatherproof driver from the worst the elements can offer. 120º x 120º dispersion, high efficiency, and excellent power handling make the Noho Ci an unbeatable choice for sports audio systems, retail and architectural installations, performance spaces, and much more.

C. Pole Mount Bracket (Stainless Steel)

D. Rated for 480 watts continuous power handling, the Noho is loaded with a coaxial 12″ bass / 1″ compression driver.

E. Neutrik speakON 2-pole twist lock speaker jacks

F. Design Make: Technomad Noho Ci INSTALL

2.5 TYPE A AMPLIFIER

A. Features:

1. 4-channel Class D power amplifier, 4,000watt max. capacity.

2. Independent volume control for each input with a front rotary operable master volume control

3. Each amplifier also offers four channels of mic/line inputs (with +12 V phantom power) directly on the back of the amplifier that act as -ramps in addition to its amplification duties. Eight configurable, bi-directional GPIO connections.

4. LED graphical panel on front with push button configuration provisions.

5. Dip switch control for clip limiters, high-pass filters, bridge-mono and parallel operation.

6. Protection circuitry: DC infrasonic, thermal overload, and short circuit

7. Provide with rack mounting kit.

8. Input connectors: 3-pin Euro

9. Output connectors: 8-pin Euro

10. Power Supply: 50/60Hz 100V - 240V

11. Capable of asymmetric power distribution across amplifier channels

12. Automatic energy saving modes ensure that the amplifier will draw the minimum amount of AC power while still providing outstanding audio quality.

B. Performance

1. Frequency response: 20 Hz - 20 kHz, +0.2 dB / -0.7 dB

2. Signal to Noise (20Hz – 20kHz): >102dB

3. Input sensitivity: 1.23mV to 17.35V

4. Gain at 8ohms: 35dB

5. Damping factor: >100

6. Typical Harmonic Distortion 1 kHz and 1 dB Below Rated Power: < 0.02 – 0.05%

7. Input Impedance: >8k balanced and >4k unbalanced

8. Outputs: 70.7V 4 x 550W, 8Ω 4 x 625W, 4Ω 4 x 625W, 8Ω Bridged 1250W, 4Ω Bridged 1150W

9. Transformer-isolated, line-level, balanced input module.

10. Adjustable gain/trim from -11 dB to +19 dB

C. Design Make: QSC QX-Q 4K4 or Approved Equal

2.6 AUTOMATIC MIXER

A. Eight balanced mic-line input channels (Phoenix block connectors)

B. One unbalanced 1/4" aux level input

C. Eight unbalanced 1/4" direct line level outputs

D. One balanced master line level output (Phoenix block connector)

E. Selectable 46V phantom power per channel

F. Level selectable peak output limiter

G. Full rack width (single rack height)

H. Design Make: Shure SCM810

2.7 WIRELESS MICROPHONE SYSTEM

A. The wireless microphone system shall include all components for a functional digital system. The system shall allow the presenter to wear a miniature lavalier style microphone or handheld microphone that transmits the speech to a body pack then via. RF to a receiver in the equipment cabinet. The system shall also include wireless handheld microphones. The RF receiver shall connect to the audio network with Dante Audio protocol over Ethernet.

B. The system shall include the following components:

1. Body-pack Transmitter

   a. External power switch, Mute switch, & Gain control knob

   b. Power on & Low battery indicator

   c. RF Carrier frequency: 470.000 to 865.000 MHz

   d. TA4F mini four-pin input connector

   e. 9 Volt battery operated (18 hour battery life)

   f. External flexible antenna

   g. Belt clip

   h. Design Make: Shure ULXD1 or Approved Equal

2. Wireless Handheld Microphone

   a. Cardioid (unidirectional) dynamic

   b. Frequency response: 50 to 15,000 Hz

   c. Wireless transmitter in base w/ adjustable gain control

   d. Input Attenuation Switch-Select 0dB for Voice/Low Output; 20dB for High Output

   e. Design Make: Shure SM58 Cardioid Microphone w/ ULX2 transmitter or Approved Equal

3. RF Receiver

   a. 19” wide rack mountable with 4 receivers in 1U high enclosure

   b. External power switch, Mute switch, & Squelch control know

   c. Power on & Individual gain controls, LED meters, and XLR outputs for each channel

   d. Includes 120V power adapter

   e. Single Telescoping antenna

   f. ¼” Phono jack audio output (unbalanced, high impedance)

   g. Dante digital networking allows multiple channels of audio over a single Ethernet cable, RJ-45 Ethernet Interface on rear.

h. Design Make: Shure ULXD4Q or Approved Equal

4. Wireless Microphone System Accessories:

a. Include with Rack Mount Kit for each ULX Receiver

b. Batteries for all transmitters and microphones

5. Design Make: Shure or Approved Equal

2.8 6-OUTLET RACK MOUNT POWER STRIP

A. 19” rack mountable, 1U

B. 6-surge protected 5-15R outlets

C. Internal circuit breaker

D. 7’, 120V cord

E. Design Make: Belden 9414-0602 or Approved Equal

2.9 AUDIO/VIDEO WALL PLATES AND PATCH CABLING

A. All headend 500mV line-level balanced and unbalanced interconnect cabling and patch cabling shall be high-resolution shielded type cable.

B. Audio cabling lengths are to be field measured unless otherwise listed.

C. All full-length cables between active components shall have factory soldered and insulated pre-terminated connectors. Field verify cable terminations requirements ie. (male/male) or (male/female).

D. Shielded Twisted Pair Audio Cable (STP)

1. Each pair shall be individually shielded with 100% aluminum foil shield conductor.

2. FEP insulated, twisted pair.

3. ASTM tinned copper 22 AWG (7x30) tinned copper red and black conductors.

4. Cable shall be UL listed NEC type CMP, constructed in accordance with UL Standard 4444 and comply with UL 1666 vertical shaft flame test.

5. Cable shall be fully functional from -20°C to 75°C.

6. Grey color outer jacket

7. Design Make: West Penn D25454 or Approved equal

E. Two Pair STP

1. Same as above description except with two individual STP cables

2. Design Make: West Penn 201454 or Approved Equal

F. 8-ohm Loudspeaker Wire

1. Unshielded

2. 2 conductors twisted, No. 12 AWG (19x25) stranded copper insulated red and black conductors.

3. UL listed NEC type CL2P

4. Grey color outer jacket

5. Design Make: West Penn 25227B or Approved Equal

G. Provide A/V Wall plates at all Multimedia A/V outlet locations shown on the drawings.

1. Wall plates shall be modular in design and accept up to (4) separate A/V modules. Modules may hold more than one jack depending on the part number.

2. Provide barrel type jacks for connecting all pre-terminated cable.

3. Provide solder and heat shrink Neutrik 4 Pole Standard or SpeakON connectors as required to connect loudspeakers.

4. Provide solder type jacks for audio cable or where bulk cable is required.

5. Wall plates shall be designed for standard 1-gang backbox mounting.

6. The wall plates shall accept the following A/V modules and jacks.

a. 3.5mm mini stereo jack

b. 3-pin and 4-pin XLR

7. Design Make: Extron or Approved Equal

3.0 PART 3 - EXECUTION

3.1 GENERAL

A. The manufacturer shall supply all information for the system wiring.

B. The sound system drawings are schematic. The system manufacturer shall incorporate their wiring requirements on the system drawings. The contractor shall be responsible, in conjunction with the system manufacturer for complete wiring requirements and conduit sizes.

C. Provide all required rigging for speaker arrays. Install the multiple curvilinear array loudspeakers in a flown configuration. In flown configurations, the first loudspeaker in the array can be connected to the grid at 0, -5, or -10 degrees with respect to the grid. The uptilt and downtilt can be adjusted using chain motors or different lengths of steel. Provide with necessary amount of Quick-Release pins. Provide with all necessary rigging and cable required for appropriate installation of multiple speaker arrays. Provide required steel truss mounting hardware. Rigging and the support of array shall be designed by a certified theatrical rigging contractor. The final design shall include a 4.0 safety factor.

3.2 INSTALLATION

A. Install all equipment shown on plan. Verify the exact location of all devices on architectural ceiling plans and elevations or with existing construction.

B. Install audio system cabling in one of the following pathways:

1. Supported with velco strips to “D-rings” where traveling on vertical walls. Provide “D-rings” 2-feet on center.

2. Supported 4-feet on center from 1” wide “J-hooks” in mechanical rooms and basements or above non air-plenum ceilings.

C. Where surface raceway is required, paint to match existing walls.

D. After system has been completely tested, “dress out” the central equipment rack. Neatly bundle all cable with nylon cable. Provide sufficient loop in the cable bundle to allow moving the cabinet away from wall for maintenance, repairs and additions.

3.3 SYSTEM TESTING AND ADJUSTMENTS

A. the inputs, outputs, equalization, delay, and gain settings for each preset with the owner.

B. Before final acceptance of the system, the Contractor, in the presence of the Owner’s representative, shall test each and every component and device in the system. Test shall be documented with signed copy submitted to the Owner and Architect/Engineer.

C. Field adjust initial volume levels and delay setting on digital signal processor based on field conditions and room acoustics. Provide (8) additional hours of on-site adjustments after the system has been installed an tested.

D. Upon completion of the system installation, it shall be the responsibility of the Contractor to perform the necessary adjustments and balancing of all signals and amplifier level controls to insure proper system operation.

E. The system shall be physically inspected by the Owner’s representative and the Architect/Engineer to assure that all equipment is installed in a neat and workmanlike manner as called for in the plans and specifications.

F. As a minimum requirement, the internal intercommunication system should be tested to prove the following:

1. The complete sound system is free from grounds, opens and shorts

2. Each device function as specified herein.

3. Proper adjustment of all speaker taps to provide clearly audible, but unobtrusive paging in all areas.

G. The Contractor shall be responsible for minor system adjustments such as tap changes, signal balancing, etc., for a period of one year after system acceptance. Respond to a call from the Owner within 48 hours. These adjustments shall be performed at no additional cost to the Owner.

H. Provide authorized technician to program the existing building PA system to interface the new take-over relay cable. Provide required terminations on the existing building PA system.

3.4 OWNER TRAINING ON SYSTEMS OPERATION

A. Upon completion of the work, and prior to acceptance of the same by the Owner, the Contractor and major equipment manufacturer's qualified representative shall spend a reasonable amount of time, instructing them on the operation and service of all the sound system equipment and controls.

B. The Contractor shall properly instruct maintenance personnel to perform emergency repairs to the system such as replacement of defective standard components such as loud speakers, amps, etc.

C. Provide (1) one-hour on-site training session for building personal managing the spaces.

D. Place sign-in sheet from training in final O&M Manuals.

3.5 INSTRUCTION MANUALS

A. The Contractor shall provide, in addition to the approved copies of the public address/intercom/clock system submittals, complete written operating instructions, pertinent system orientation documents, and system service and parts list and testing documentation.

B. The Contractor shall provide four complete sets of service manuals and wiring diagrams of the entire system, including manufacturer's parts and numbers, schematics, complete with operating information, including equipment characteristics, operating voltages, etc.

3.6 WARRANTY

A. Provide one-year warranty on all parts and labor.

B. The warranty shall take effect after the Owner has accepted the system.

END OF SECTION 274100

SECTION 275129 – EMERGENCY COMMUNICATION SYSTEMS

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, equipment and services required for the installation of a complete and functioning microprocessor-based Emergency Communication System and sound system as shown on the drawing and described in this section.

B. Provide all programming and licensing required to interface the Emergency Communication System with the owners existing Cisco VOIP system. Coordinate this work with the district IT representative and BOCES.

C. Electrical Contractor to provide cabling as specified in Section 271000 - Horizontal and Backbone Communication Cabling and as called for on the plans.

D. Electrical Contractor to provide (1) 3-foot Cat. 6 patch cable for each IP speaker and IP strobe.

1.2 BASIS OF DESIGN

A. The district has an existing Board Resolution that all access control equipment, licensing, and integration services for the project shall be procured from and authorized ATLAS-IED dealer. Day Automation is the current service contractor for the districts Emergency Communications System. The Electrical Contractor shall procure all hardware, wiring, and installation of the equipment specified in this section. The district will provide all licensing and programming of the Emergency Communications System.

1.3 SCOPE OF WORK

A. Provide interconnection input/output wiring to the Emergency Communications System, Fire Alarm System, and Access Control System per the sequence of operation as defined in specification section 283110 - Fire Detection and Alarm System with Voice Evacuation.

B. Provide a Excel spreadsheet with the MAC address of each installed IP Speaker device along with its room number and location to the owner to facilitate programming.

C. The following work will be provided by the owner:

1. Coordination assistance to the owner and electrical contractor for decommissioning during construction of the existing public address system.

D. Disconnect and remove the existing analog Public Address System speakers, volume control switches, call-in stations, associated backboxes and grills, and associated wiring back to the public address system headend cabinet in areas of renovation as shown on the drawings.

E. Disconnect and remove existing wireless clocks in areas of renovation as shown on the drawings.

1.4 SUMMARY

A. This section includes a fully operational school internal and external normal and emergency communications system incorporating master clock, program event notification, textual programmable messaging, safety, including but not limited to the following:

1. Two-way Loud Speaking Internal Intercommunications.

2. Event Announcement.

3. Emergency announcement that will override any pre-programmed zones assuring that all Emergency/Lockdown etc. are heard at each and every speaker location. Lockdown event notification thru audible, visual displays, and visual strobes.

4. Capability of prerecording emergency announcements that can simply be activated by simple Soft Key or via a dedicated call-switch.

5. School Safety Paging and Evacuation tones.

6. Distributed (MDF/IDF) Electronic Architecture. (No home run wiring for each circuit).

7. Network time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.

8. Paging and Program Distribution.

9. Incorporate district-wide announcements, either live or recorded thru a direct connection to the LAN and VOIP telephone system.

1.5 SUBMITTALS

A. Product data for each component.

B. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of all equipment and materials with associated manufacturers cuts sheets which are to be used.

C. Wiring Diagrams: Detail wiring for power, signal, control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.

D. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.

E. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor’s name in the title block.

F. Details and description of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.

G. FCC Approval: The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems, which are not FCC approved or utilize an intermediary device for connection, will not be considered. Provide the FCC registration number of the system being proposed as part of the submittal process.

H. Product Certificates: Signed by manufacturers of equipment certifying that products furnished comply with specified requirements.

I. Installer Certificates: Signed by manufacturers certifying that they comply with requirements.

J. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.

K. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

L. Maintenance Data: For equipment to be included in maintenance manuals specified in Division 1.

1. Record of Owners equipment-programming option decisions.

2. All instructions necessary for proper operation and manufacturer's instructions.

3. "Proof of Performance" information.

4. Manufacturer's maintenance information.

5. Copies of non-proprietary computer programs and system set up disks documenting all programmable features of the installed system.

M. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".

N. System Training: Submit the following information describing the training programs and system trainers as outlined in this specification and in accordance with Division 1 specifications.

1. Include with the submittal a preliminary staff development training program in outline form for review and approval by the Owner's Representative.

2. Include with the submittal a current copy of the trainer's certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.

3. Include with the submittal a current copy of trainer's need's assessment form which will be reviewed with the Owner's Designated Representative for the system's preliminary system programming and configuration.

4. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.

O. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. Provide the following within thirty (30) days after notification to proceed:

1. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.

2. The installer shall be bondable.

3. The Installer shall demonstrate to the satisfaction of the Owner or his representative that he has:

a. Adequate plant and equipment to pursue the work properly and expeditiously.

b. Adequate staff and technical experience to implement the work.

c. Suitable financial status to meet the obligations of the work.

d. Technically capable and factory trained service personnel at local service facility to provide routine and emergency service for all products used in this project.

B. Any Contractor, who intends to bid on this work and does not meet the requirements of the "Quality Assurance" paragraph(s), shall employ the services of an "Installer" who does meet the requirements and who shall provide the equipment, make all connections and continuously supervise the installation. A subcontractor so employed as the "Installer" must be acceptable to the Architect/Engineer. The "Installer" shall be identified within thirty (30) days of notification to proceed for acceptance by the Architect/Engineer.

C. Because the life expectancy of this type of communications system normally exceeds 10 years, the owner expects continuity from the service provider. Therefore, the installing/servicing company must have been an authorized provider of the manufacturers product for at least 10 years.

D. Each major component of equipment shall have the manufacturers name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL Label, or other data that is die-stamped into the surface of the equipment shall be easily visible.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA, Article 100, by testing agency acceptable to authorities having jurisdiction.

F. Comply with NFPA 70.

G. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.

H. Comply with UL 60950.

2.0 PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. The system shall utilize SIP communication, allow real time and pre-recorded message paging, and provide Emergency Communication and Lockdown notification integration with other systems, and IP network time synchronization. Notification will be provided by Loudspeakers both Internal and via. blue light strobes visual notification. All standard system programming shall allow a local system administrator to program and modify system settings thru the LAN.

B. Provide complete and satisfactorily operating school communications and School safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

C. The system shall be single electronic system consisting of amplified intercom channels depending upon the configuration of the system, clock/speakers, standalone speakers, visual notification appliances, and master clock.

D. The system shall lend itself to expansion by closed contact, SIP, and Informacast compliant connected hardware.

E. The system shall allow the implementation of bell schedules that are managed via the WAN/LAN. The system shall directly connect to the WAN/LAN without the need for a separate computer at the school location. Bell schedules can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.

F. The system shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone within the facility or outside the facility to any other location within the facility. The system must also allow the implementation of a district-wide announcement system, where live messages, pre-recorded announcements and emergency tones can be triggered via a telephone or browser-based user interface.

G. The system shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands free and will not require any interaction by the end-user to answer.

H. Room speakers, shall be programmable and may be assigned any two, three four- or five-digit number. Any extension may be reassigned at any time, and it shall not be dependent on wiring or circuit numbers.

I. Amplified two-way voice communication shall be available from any provided telephone through any speaker in the system. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active, complying fully with all privacy legislation.

J. Integrated Master Clock with unlimited schedules, unlimited events, and automatic Daylight Savings time correct. Up to 5 schedules may be active on any given day. User shall be able to select form 15 tone options or user created .wav files for class change signaling. In addition, the system shall allow unlimited user defined class change tones to be recorded. The system shall allow control of the bell schedules via the district WAN/LAN. The system shall directly connect to the WAN/LAN without the need for a separate computer at the school location. Bell schedules can remotely be created, changed, stored and downloaded to the system by an authorized user from a browser-based interface.

K. Ability to correct and power secondary clocks using the same Cat.6 cable drop used for intercom speaker.

L. Functionality for browser-based access and control of the system.

2.2 CENTRAL EQUIPMENT AND MATERIAL

A. Features and Capabilities:

1. The ability to network multiple controllers via the LAN to provide a single interconnected system within the facility. The networking capability must provide for total transparency between controllers and in turn operate as a single system.

2. On-site or off-site diagnostics shall be capable via a standard Ethernet port for factory-trained personnel. The controllers shall tie directly into the LAN. In addition, all bell scheduling tasks must be browser based allowing authorized access from off-site district staff. On-site facility staff may also perform these tasks in the same manner as the district staff.

3. System shall connect to the existing district Telephone Network via an analog trunk, or station port.

4. Support a flexible numbering plan allowing two, three, four or five digit extensions. The two, three four and/or five digit extensions can be intermixed within the same facility. Each extension can include leading or trialing alpha digits to match a facility's room numbering scheme.

5. Multiple attendant positions via district provided Telephone Network shall be capable of answering internal intercom call-ins a minimum of one (1) Marquee Display shall be provided.

6. Personal Identification Numbers (PIN's) shall be available for all staff. By dialing their PIN at any provided telephone, the staff member shall have access to the School Internal Intercom and Public Safety Network.

7. Reports on feature usage, system activity, etc. shall be available upon request either on site or remotely.

8. Direct Dialing, two-way amplified voice intercom between any provided telephone and speaker without the use of a press-to-talk or talk-listen switch.

9. DISA: Direct Inward System Access. The system can be configured to allow access to all system features/functions (paging, intercom, evacuation tones, class tone schedule selection, etc.) from any offsite DTMF dialing telephone via the district provided Telephone Network. Only authorized individuals may use this feature by dialing into the system through a dedicated trunk number, with or without a pass code, and then dialing a system function.

10. System must support data style structured cabling utilizing Patch Panels that allow quick, Cat. 6 connection of various headend, distributed and classroom devices. Speakers and clocks shall be wired using a single Category 6 cable. Systems requiring a custom cable plant will not be acceptable.

11. The ability to initiate Class of Service changes either manually or automatically on a per station basis based on time of day, day of the week, and calendar via the integrated master clock.

12. Ability to perform any system feature or function from any authorized telephone.

13. Intercom/Paging/Tones/Clock Correction Module.

14. Two-way communication between any telephone and any room speaker.

15. Preannounce tone prior to connecting any intercom conversation to alert the user to the call and prevent unauthorized monitoring. A tone shall be automatically repeated at regular intervals for the duration of the intercom call if the voice circuit is not activated. A requirement to meet existing privacy laws.

16. Audio paging access from any telephone to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire facility.

17. Single button access from any telephone on the system to distribute emergency announcements within the facility to all or select locations equipped with speakers. Emergency announcements originating from any assigned administrative telephone shall have priority over all regular system functions.

18. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with speakers. Up to Sixteen (16) separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular systems functions.

19. The system will have the ability to utilize a web-browser and USB microphone to deliver live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.

20. The system can automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.

21. Multi-level call-ins can be placed form either a classroom telephone or a call-in switch. The call-ins route to select or all administrative telephones and can only be cleared from the system once answered from an administrative telephone. If a call-in is not answered within a preprogrammed time the call-in may route to other administrative telephone(s) announce over selected or all speakers and shall have the capability to also reroute calls to predefined Mobile telephones. Emergency call-ins can also be programmed to send e-mail alerts to specific addresses.

22. Classroom teachers shall have the capability to exclude pages and tones from their individual classroom for testing or other purposes. This exclusion cannot affect emergency pages. This exclusion will reset at midnight.

23. The system can automatically alter a call switch’s class of service by time of day and date via the integrated master clock.

24. The capability to assign speaker locations to any one or more of the Sixteen (16) independent program/music distribution zones and sixteen (16) independent class change tone reception; this assignment is a programmable function. Each location shall be programmed in software to belong to any combination of software zones. Software/hardwired zones must be configured as part of an unlimited number of district wide groups for school district emergency announcements. These district announcements must be accessed via microphone, a web-browser or telephone.

25. Automatic class change tones sent through all or selected intercom/paging speakers and/or horns. Any combination of up to Sixteen (16) tones can be sounded to indicate different events. Up to Sixteen (16) different class change schedules can be stored in the system and selected manually from an administrative telephone, web browser or selected automatically based on time, day of the week and date. Tone type and duration are selectable for each class change event. An unlimited number of class change events can be programmed as part of the system.

26. Programmable "Music-on-Class-Change." A program source can be automatically routed to select zones of paging speakers or all speakers within the facility during each class change period.

27. The system shall provide facilities to distribute program material (mp3, CD, radio broadcasts) in the following manner:

    a. The user shall cue remotely located music source or select radio station.

    b. From an Administrative Telephone the user can select the room(s) or areas to distribute program.

    c. Automated distribution based on event schedule.

28. The module provides for secondary clock correction with the following features and functions:

    a. User programmable Automatic Daylight Savings Time Change.

    b. Latched operation of zone outputs to control lighting or other devices.

    c. Interface with most types of secondary slave clocks whether synchronous wired, wireless or electronic.

    d. User-programmable custom slave clock correction. Output relays rated at 5 amperes shall be provided on all zone circuits as necessary.

    e. Ability to correct and power secondary clock using same Cat. 6 cable supporting intercom speakers. Secondary clocks requiring more than 15 mA shall not be acceptable.

29. System has the ability to sync system time to the Atomic Clock Signal or the school's or district's network time server. System has the ability to offset system time (+) or (-) 15 minutes from true atomic time to accommodate bus schedules or other scheduling issues.

30. The module provides classroom security and call switch supervision with the following features and functions:

    a. All field wiring connected to the system shall be capable of individual supervision for opens or shorts.

    b. System shall be capable (future) to accept multiple alarm inputs from the main security and/or fire alarm system. Emergency tones and/or announcements can therefore be triggered, via the primary security and/or fire alarm system, to provide redundant annunciation using the classroom and corridor speakers.

31. Intercom and paging speakers/horns can be assignable to any one or more of the Sixteen (16) zones for zone paging, up to Sixteen (16) zones for program distribution, and Sixteen (16) zones for class change tones. Any of these zones may be part of a district created emergency paging zones allowing paging groups of different facilities within the school district. All of these zones may be configured to be independent of the other zones and in any combination. Below is an example of paging zone scheme. The initial scheme at each building shall be determined by the Owner.

    a. Pre-K

    b. Kindergarten

    c. Grades 1-3

    d. Grade 4-5

    e. Special Education

    f. Teachers' lounge and workrooms

    g. Common areas

    h. Administrative areas

    i. North Outside Speaker Area

    j. South Outside Speaker Area

    k. West Outside Speaker Area

    l. East Outside Speaker Area

    m. Gymnasium

B. Provide all software and licensing as required to accomplish the system described in this section.
C. Provide speaker control assemblies for connection of all new and spare capacity for connection of an additional 25% of the total connected speakers.
D. Design Make: Expand existing InformaCast Emergency Communication System

2.3 IP CLOCK/SPEAKER UNITS WITH FLASHERS

A. Surface Mounted:

1. Audio:

a. Bell scheduling, alerts, reminders, clock chimes, and alarms via software

b. Voice paging from a PC or IP phone, scheduled or ad hoc

c. Use packaged or custom notifications

d. Integrated Amplifier 15-Watt Total Power: Primary and Secondary Remote Speaker Output 8 ohm

e. 8” Diameter Speaker:

1) Frequency response uniform over 88 to 15,500 Hz.

2) Average sensitivity of 98 dB at 1 meter with 1 watt input.

2. Flashers:

a. Configurable for emergencies or alerts

b. Flash color range: Red, Green, Blue, White, Purple, Orange, Yellow

3. Clock:

a. 3” numbers/text

b. Atomic time

c. Never needs setting

d. Auto-adjust for Daylight Savings

e. Display 4 or 6 digits

4. Scrolling Text:

a. Supports multiple types of messages:

1) Custom configuration

2) Reminders

3) Alerts

4) Advertising

5) RSS/Twitter/News/Weather/Stock Feeds

6) 1- or 2-Line Display

5. Auto Dimming: Automatically dim for different times of day. Reduce power usage at night to save energy.

6. Built-in web server:

   a. Send text messages to the device from a web page

   b. Configurable brightness, fonts, volume

   c. Configurable NTP time server, time zone

   d. Device status

   e. Field upgradable

7. GPIO:

   a. 2 inputs, 1 output

   b. Can be activated multiple ways including via telephone of programmatically

8. Multicast: Full multicast and broadcast support. Send audio to individual, multiple or all devices simultaneously.

9. Sound masking: Generate configurable pink noise via push button or programmatically.

10. PoE (IEEE 802.3af): 15.4W or PoE+ (IEEE 802.3at) 30W

11. 10/100 Network Connection with RJ-45 port

12. Supported Protocols: InformaCast, SIP, HTTP/SLP/ID NET, HHTP/TFTP, NTP, DHCP

13. Provide with surface mount enclosure.

14. Provide wire guard for gymnasiums and multi-purpose rooms.

15. Dimensions: 13.9” W x 15.5” H x 5.5” D

16. Weight: 4.25 lbs.

17. Design Make: Atlas IED IP-SDMF-72 with IP-SEST-SD Enclosure

2.4 IP DOUBLE SIDED CLOCK/SPEAKER UNITS WITH FLASHERS

A. Surface Mounted:

1. Audio:

a. Bell scheduling, alerts, reminders, clock chimes, and alarms via software

b. Voice paging from a PC or IP phone, scheduled or ad hoc

c. Use packaged or custom notifications

d. Integrated Amplifier with Dual Remote Speaker Output 8 ohm

e. 3” Diameter Speakers on each side.

B. Frequency response uniform over 88 to 15,500 Hz.

C. Average sensitivity of 98 dB at 1 meter with 1 watt input.

D. Audio Power: 25W

1. Flashers:

a. Configurable for emergencies or alerts

b. Flash color range: Red, Green, Blue, White, Purple, Orange, Yellow

2. Clock:

a. 3” numbers/text

b. Atomic time

c. Never needs setting

d. Auto-adjust for Daylight Savings

e. Display 4 or 6 digits

3. Scrolling Text:

a. Supports multiple types of messages:

1) Custom configuration

2) Reminders

3) Alerts

4) Advertising

5) RSS/Twitter/News/Weather/Stock Feeds

6) 1- or 2-Line Display

4. Auto Dimming: Automatically dim for different times of day. Reduce power usage at night to save energy.

5. Built-in web server:

a. Send text messages to the device from a web page

b. Configurable brightness, fonts, volume

c. Configurable NTP time server, time zone

d. Device status

e. Field upgradable

6. GPIO:

a. 2 inputs, 1 output

b. Can be activated multiple ways including via telephone of programmatically

7. Multicast: Full multicast and broadcast support. Send audio to individual, multiple or all devices simultaneously.

8. Sound masking: Generate configurable pink noise via push button or programmatically.

9. PoE (IEEE 802.3af): 15.4W or PoE+ (IEEE 802.3at) 30W

10. 10/100 Network Connection with RJ-45 port

11. Supported Protocols: InformaCast, SIP, HTTP/SLP/ID NET, HHTP/TFTP, NTP, DHCP

12. Provide with surface mount enclosure.

13. Provide wire guard for gymnasiums and multi-purpose rooms.

14. Dimensions: 20.42” W x 9.5” H x 6.91” D

15. Weight: 14.2 lbs.

16. Design Make: Atlas IED IP-DDS

2.5 BLUE LIGHT VISUAL STROBE

A. Located in interior and exterior locations as shown on the plans.

B. 48V POE IEEE 802.3af rated RJ-45 Cat. 6 input

C. Configuration: SIP Page, SIP Multicast & Zoned Multicast Stream endpoint.

D. Preconfigured for blue light strobe at 1Hz and 160 candela output to meet UL 1638 and UL 1971 requirements. Unit is capable of 4 colors (16 LEDs each), adjustable 15 flash patterns, and 3 intensity levels.

E. Synchronized with all other strobes in same paging group.

F. Activation: Ring event, API, or dry contact closure. The device is also multicast transmit and receive capable. This can help you scale and trigger as many other 8138 IP Visual Alerters or other endpoints and keep them synchronized with each other.

G. Supervision: Compatible with Algo Device Management Platform (ADMP), Algo 8300 IP Controller, any third-party SNMP monitoring software, and RTCP. Normally open or normally closed dry contact with supervision, EOL termination.

H. Unit shall be constructed of heavy gauge polymer construction. Provide gasket between speaker flange and mounting surface. IP66 rated. -40 to +123 deg F operating range.

I. Provide surface mounted back box in existing construction.

J. Normally open or normally closed dry contact with supervision, and EOL termination.

K. Design Make: ALGO 8138-IC or Approved Equal

2.6 REMOTE SPEAKER ASSEMBLIES

A. Analog Flush Ceiling Extension Speaker

1. 8” Square Speaker Assembly.

a. 1” voice coil with 10-ounce woofer magnet weight and 2.35-ounce tweeter ceramic magnet weight.

b. Frequency response uniform over 70 to 15,500 Hz.

c. Axial sensitivity of 96 dB at 1 meter with 1-watt input.

d. 16-watt RMS power rating.

e. 8-ohm voice coil impedance.

2. Baffle:

a. 20 gauge cold-rolled steel, nominal 11-1/2’ square.

b. Scratch and mar-proof white baked powered epoxy finish.

3. Back Box:

   a. Square recessed box constructed of one piece 20-gauge steel with white powered epoxy finish and an interior treated with a fire retardant resonance damping material.

   b. Bottom interior of box shall have a 9” diameter pad of 3/8” thick acoustic foam for additional vibration and resonance control.

4. Design Make: Atlas IP-SA speaker with 161-8 baffle and 170-8 back box.

B. IP Flush Ceiling Extension Speaker

1. Provide in interior corridor locations as shown on the plans.

2. 48V POE IEEE 802.3af rated RJ-45 Cat. 6 input

3. Configuration: SIP Page, SIP Multicast & Zoned Multicast Stream, SIP ring Alert, Auto-provisioning server or web-based interface option. DHCP or Static.

4. Sensitivity: 120 dBA

5. Microphone: Electret Omnidirectional Wideband

6. Flush mounted 8” round speaker, 8-ohm nominal

7. Frequency range of 85 to 15,000 Hz, dispersion angle of 105-degree Vertical x 105-degree Horizontal

8. White 11.5”x10” square white finished flush steel grill with perforated openings below speaker.

9. Provide recessed mounted back box and tile bridge for lay-in ceiling installation.

10. Design Make: Atlas IED IP-8SM with IP-FEST-S backbox and IP-STB tile bridge or Approved Equal

C. IP Exterior Horn Type Speaker

1. Located in interior large venue locations and exterior locations as shown on the plans.

2. 48V POE IEEE 802.3af rated RJ-45 Cat. 6 input

3. Configuration: SIP Page, SIP Multicast & Zoned Multicast Stream, SIP ring Alert, Auto-provisioning server or web-based interface option. DHCP or Static.

4. Output:

   a. SPL: 116 dBA at 1M

   b. 8 watts audio

5. Microphone: Electret Omnidirectional Wideband

6. Wide angle paging projector with integrated driver assembly and double re-entrant, non-resonant, heavy-duty ABS resin horn. 3-axis adjustable aim wall mount bracket.

7. -40-degree to +122 degree F operation, IP66 wet environment rated

8. Frequency range of 350 to 9,000 Hz, dispersion angle of 76-degree Vertical x 51-degree Horizontal

9. Unit shall be constructed of heavy gauge polymer construction. Provide gasket between speaker flange and mounting surface. All exterior parts and hardware shall be impervious to weather. Weatherproof gray finish.

10. Provide surface mounted back box in existing construction.

11. Normally open or normally closed dry contact with supervision, and EOL termination.

12. Design Make: ALGO 8186 or Approved Equal

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. Electrical Contractor to provide (1) 3-foot Cat. 6 patch cable for all new IP speakers and IP strobes. Install all devices where shown on plans and connect patch cable to wall jack to speaker input.

B. General: Install system in accordance with NFPA 70, NFPA 72 Chapter 24.

C. Configure blue light strobe output UL1638 and UL1971. Install equipment in accordance with manufacturer's written instructions.

D. Furnish and install all material, devices, components and equipment for a complete operational system.Impedance and Level Matching: Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.

E. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and NFPA 72 Chapter 24 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated of specified.

F. Install system cabling in one of the following pathways:

1. Supported by cable hangers 4-ft on center above accessible ceilings.

2. In new raceway for all exposed locations in finished classrooms, offices, conference rooms, faculty rooms, and corridors. Where surface raceway is required, paint to match existing walls.

3. In conduit in Mechanical areas such as the boiler room and fan rooms.

G. All housings are to be located as indicated.

H. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Inspection: Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.3 FINAL ACCEPTANCE TESTING

A. The Final Acceptance Testing shall be provided to the Owners representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.

B. The contractor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner's Representative establishing the "In Warranty" date. The warranty period will not commence until the Final Acceptance Test is completed.

3.4 CLEANING AND PROTECTION

A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

3.5 IN-SERVICE TRAINING

A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.

B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.

C. All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all of the staff and faculty members who attended, received, and completed the training program.

3.6 WARRANTY

A. Provide a manufacturer's five-year warranty of the school communications network equipment against defects in material and workmanship. This warranty will cover all electronic equipment, as well as clocks, speakers, and call-in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one year warranty shall be provided for labor.

B. A copy of the manufacturer's standard statement of warranty proving all equipment provide for the school communications network is covered with the required five-year warranty shall be provided on the manufacturer's stationary. The standard five-year warranty is an important element in establishing a standard in quality. Manufacturers who circumvent the five-year warranty by offering special "extended warranties" that are not part of their normal published warranty will not be accepted.

C. Contractor shall respond, excluding weekends and holidays, within 24 hours to any warranty service calls. If equipment cannot be repaired within 24 hour of service visit, the contractor shall provide "loaner" equipment to the facility at no charge.

D. Make available a service contract offering continuing factory authorized service of the system after the initial warranty period.

END OF SECTION 275129

SECTION 281619 - INTRUSION DETECTION SYSTEM

1.0 PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 SCOPE OF WORK

A. Provide modifications to the existing Emergency Responder Panel (Security Panel) in each building and all new I/O hardware and programming for lockdown notification the first responders. The existing BOSCH B9512G Emergency Responder Panel is serviced by Eastern Security Services.

B. All new alarm input devices shall be addressable or provided with required addressable input modules.

C. The system shall include but not be limited to the following:

1. Intrusion Detection Panel (IDC)
2. Zone Expansion Modules
3. Relay/Power Modules
4. Motion Sensors
5. Key Pads
6. Door Contacts
7. Addressable Modules
8. System Wiring (plenum rated)

1.3 QUALITY ASSURANCE

A. All Intrusion Detection system devices shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Materials specified herein shall comply with the applicable requirements of:

1. The following Articles of the National Fire Protection Agency:

a. NFPA 71 - Central Station

b. NFPA 72 - National Fire Alarm Code

1.4 SUBMITTALS

A. Provide product data for all security system components including bill of material.

B. Provide complete wiring diagram for each building showing the following:

1. All system wiring and devices.

2. Wiring legend for all system wiring

3. Typical terminations for all system components.

4. Floor Plans showing location of all system components and addresses.

5. Control Panel wiring scehmatic

6. I/O connection to existing BOSCH B9512G Emergency Responder Panel.

1.5 SEQUENCE OF OPERATION

A. Coordinate all sequence of operation events with the existing configurations on the district wide access control system.

B. Upon an abnormal condition on the security system, abnormal events shall be logged into the database, along with the date and time.

C. Operation of Arming/Disarming the system shall follow the following procedure:

1. Keypads will be used for arm/disarm functionality.

2. 60-second delay for arm/disarm to and from keypad.

D. Operation of any motion detector / door contact while system is armed shall cause the following to happen:

1. Display the points in alarm at the control panel display. The visual indication shall remain until the alarm condition is reset

2. Sound system alarm horns associated with the alarm partition.

3. Notify the Building Emergency Responder Panel control panel addressable input module programmed for “Lockdown”. Coordinate programming with the owner.

4. Subsequent alarms shall repeat the respective sequence of operations.

E. The System wiring and power supplies shall be electrically supervised and report trouble conditions to the control panel. Any opens, shorts or grounds on the system wiring shall cause the following to happen:

1. Display the points in alarm at the operator workstation and point at all system printers. The visual indication shall remain until the alarm condition is reset.

2. Notify the radio call box in the building. Coordinate programming with the district's security group.

3. Subsequent trouble alarms shall repeat the respective Sequence of Operation.

2.0 PART 2 - PRODUCTS

2.1 INTRUSION DETECTION SYSTEM PANEL

A. Modify and expand the existing BOSCH B9512G maintained by Eastern Security Services.

2.2 KEYPADS

A. Digital user interface station to arm/disarm the system or associated partition.

B. Large, backlit, Touch screen keypad, prox/input/output, white finish.

C. Ready, armed and trouble LEDs, 5 programmable function keys, 4 keypad activated alarms.

D. Plain language display of zone status, system status, trouble conditions, event buffer, system instructions, date and time.

E. Design Make: BOSCH B942W

2.3 ADDRESSABLE INPUT MODULE

A. Point addressable, 2 wire multiplexed loop, low current draw.

B. Both modules include proven technology that combines zone and point supervision with individual device addressing on one pair of wires. Screw terminals provide reliable connections for the data expansion loop and supervised sensor loop wiring. Install a 33 kΩ end-of-line resistor at the farthest point on the loop for proper supervision. The units are small and easily installed in standard outlet boxes, above false ceilings, closets, or other accessible locations.

C. Design Make: BOSCH D9127 POPIT input module without tamper

2.4 DOOR CONTACTS

A. Surface mounted type in existing doors.

B. Double throw double pole contacts.

C. Maximum 1” gap between contacts and magnet.

D. Design Make: Day automation dual purpose door contact with separate impedance leads for Access Control and Intrusion Detection Systems

2.5 MOTION SENSORS

A. All motion detectors shall be point addressable, 2 wire multiplexed loop, low current draw.

B. Provide with necessary ceiling or wall mounting brackets.

C. Passive Infrared, multi level signal processing, duel element low noise sensor, 32-122 F temperature compensating operating range.

D. Wall mounted area motion sensor:

E. 40’ x 40’ viewing pattern.

F. Dynamic Temperature Compensation – superior catch performance in any environment

G. Flexible Mounting Height, No Adjustments – reduce installation time and false alarms, improve catch performance

H. Self-locking Enclosure with Integrated Bubble Level – reduce installation time

I. Design Make: BOSCH ISC-BPR2-W12

2.6 ALARM SIREN (Interior)

A. 12 VDC electronic horn.

B. Steady and pulsed tones, 90 dBA output

C. Suitable for flush or surface mounting.

D. Includes accessory Dual relay module for 2A at 30VDC

E. Design Make: BOSCH with D134 relay module

2.7 SYSTEM WIRING

A. The number of pair per. jacket shall be as required by the system installer.

B. The quantity of shielded or unshielded pair shall be determined by the system manufacturer.

C. Cable shall be ASTM tinned copper, 18 AWG (7x26 stranded), twisted pairs, 20 strand shielded drain wire unless recommend otherwise by the system manufacturer.

D. 300-volt insulation.

E. Cable shall be UL listed NEC type CMP, constructed in accordance with UL 444.

F. Cable shall be fully functional from -10°C to 60°C.

G. Individually colored conductors.

H. Design Make: West Penn/CDT or Approved equal

3.0 PART 3 - EXECUTION

3.1 INTRUSION DETECTION CONTROL SYSTEM

A. Installation:

1. Install all equipment and materials in accordance with the recommendations of the manufacturer.

B. Install all cabling with one of the following methods:

1. All exposed wiring in finished occupied areas shall be provided in a metal raceway system.

2. In ring run supported 4’ on center above accessible ceilings, and in crawl spaces.

3. In areas noted where exposed cabling is allowed it should be supported in ring run 4’ on center. Use cable ties to attach cable bundle to ring run for a neat appearance.

4. In PVC conduit in pool areas and pool mechanical room spaces.

5. In metallic surface raceway in finished areas only where unable to conceal or fish walls.

C. Programming of the system shall include the following tasks:

1. Meet with the owner’s maintenance and security staff to review system programming parameters.

2. Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters and separate alarm partitions).

3. Programming operational parameters such as opening/closing reports and windows, system response text (custom English) displays of events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.

4. Programming passcodes according to the authorities and functions defined by the Owner.

5. Other system programming tasks required by the Owner. These additional programming requirements shall be coordinated between the Owner and the contractor.

6. Program system with separate “partitions” for various areas of the building. These partitions shall include separate alarm key pad control and area arm/disarm for areas like computer classrooms. Meet with owner’s representative and program system per that direction.

D. Testing:

1. Operational Testing: The contractor shall perform thorough operational testing and verify that all system components are fully operational.

2. Hard-copy System Printout: The contractor shall submit a hard-copy system printout of all components tested and certify 100 percent operation indicating all devices/panels/units have passed.

3. Confirm with owner that system is operating and programmed per the owner’s requirements. Submit sign off that system has been fully tested and is operating per owner’s requirements.

3.2 MOTION SENSORS

A. Install motion sensors in locations shown on plans.

B. Make adjustments to aiming of motion sensors to optimize viewing pattern.

C. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through.

3.3 SYSTEM PROGRAMMING

A. The system installer shall meet with the owner as many times as necessary to finalize system programming. The installer shall review the owner’s security plans and policies and make programming decisions based on that plan.

3.4 RECORD DRAWINGS

A. Provide Floor plans showing:

1. Locations and zone address for all devices.

2. Wiring pathways and wire counts for the entire system.

B. Provide listing of all devices and system addresses.

3.5 COMMISSIONING

A. The contractor will schedule a system acceptance test with the engineer and the owner.

B. Make all changes required from the punch list generated during initial testing. Schedule a second acceptance test with the owner. If additional testing is required after the second test, the contractor will reimburse the owner for their time at a rate of 2 times their expenditure for their actions.

C. Upon final completion of the punch list as determined by the owner, all systems and associated equipment furnished by the Contractor will be subjected to a thirty (30) consecutive day operational test to determine the reliability of the equipment. If the results of this operational test are acceptable to the owner the warranty period will begin.

D. If the system fails during the 30 consecutive days, the Contractor will resolve the problems and start the test again beginning with day one. The Contractor will be given two (2) opportunities to successfully complete the 30 consecutive day operational test.

E. The performance of all systems, will not be less than 100% during the operational 30 consecutive days test period. 100% performance is defined as no trouble reports attributable to the system or Contractor's actions during the acceptance period. The owner may add other requirements to the Standard of Performance, as it deems necessary.

F. The system will not be accepted for operational use and final payment will not be authorized until the owner determines that the system is deemed acceptable.

END OF SECTION 281619

SECTION 282319 - HIGH-DEFINITION IP VIDEO SURVEILLANCE

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, licensing, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, licensing, engineering and service necessary to provide a complete and operating IP CCTV Camera System as shown on the drawings and described in the specifications.

B. The following system components are specified in this section:

1. Licensing and Integration to existing Network Video Recorder Software and Hardware

2. IP Camera (Types A & B)

3. Video Cabling

1.3 ACCEPTABLE MANUFACTURERS

A. North Syracuse CSD has an existing Board Resolution on manufacturer standardization. All IP Camera hardware and software shall be from or approved by the manufacturer Avigilon.

B. The electrical contractor shall purchase all High-Definition IP Video Surveliance equipment and licensing, and integration services from Day Automation. The Electrical Contractor shall install all equipment and provide the required wiring. All programming and licensing shall be provided by Day Automation.

1.4 SYSTEM DESCRIPTION

A. The network video recorder allows the recording, live viewing, and playback of recorded video for periods of up to one month without the need for external storage. NVR performs all viewing, playback, and video storage functions simultaneously.

B. A large formal LED TV shall be wall mounted in the main office to provide viewing of client selected cameras over the network. A PC shall be provided with client software to allow viewing of client selected video feeds. These camera views shall primary be selected to allow access into the building and supervise main points of entry and pickup.

C. Provide the following video record settings on each NVR and/or archive server:

1. Duration of recording without overwrite – Per District’s Requirements.

2. # of connected camera per NVR – Refer to Drawings

3. Image resolution setting Type A IP Camera – 5 megapixel

4. Image resolution setting Type B IP Camera – 8 megapixel

5. Video Encoding – H.264

6. Record Frames per. second – (8) Eight

7. Record Time – On motion and 4-seconds prior

D. NVR Setup Standards:

1. Install latest Microsoft and NVR manufacturer updates and patches.

2. Contractor to install and configure latest SQL Server Express if required.

3. Coordinate joining the new NVR to the domain with the District IT representative.

4. Add local building user group account access from existing windows domain.

5. Server Name: S0xxSEC-yy (xx = Building #; yy = Server #).

6. Coordinate IP Address setup with District IT representative.

E. Camera Setup Standards:

1. IP Address by provided by owner IT representative

2. Camera Standard: 172.16.xx.zz (xx = Building #; zz = Camera 1, 2, 3….)

3. Subnet Mask: 255.255.252.0

4. Gateway: 172.16.0.1

F. NVR recorders are rack-mountable boxes equipped with external IP encoders Video is displayed on a standard monitor, and configuration is performed through a standard mouse and keyboard interface.

G. NVR is configured with control software and can record video continuously, only during alarm events, or only while activity is present. Each camera can record in different modes and on different schedules, or they can be configured the same.

H. Control software allows for search and retrieval of video. User-defined parameters allow searches based on the time and date the video was captured, whether alarm or motion events occurred, and which camera captured the video. The software also permits full video storage management, hardware control, alarm configuration, and export of video and individual frames.

I. System shall have the ability to use remote viewing software with the ability of viewing live or recorded video over standard network or modem connections. This software shall be available at no cost to the user and shall be downloadable using standard internet connections.

J. Video Surveillance at the Buildings

1. CCTV Camera and Enclosure systems types are identified on the drawings. Refer to this section of the specifications for system descriptions.

2. Surveillance cameras will be located at selected entrance doors, corridors and rooms inside the building as indicated on the plans.

3. Surveillance cameras will be located on the building exteriors to monitor selected parking lots, entrances and secluded areas.

4. PAN-TILT-ZOOM cameras shall be controllable via from the NVR headend or any remote Ethernet workstation with the NVR monitoring and control software.

5. Cameras will be field selectable for activation on motion within the cameras viewing range or to be permanently on.

6. All cameras that are activated shall be recording digital video to the server. The server will automatically save all video and overwrite hard disk media per. custom client settings.

7. In the event of a NVR or network failure video shall automatically save to SD cards installed locally in equipped cameras.

8. The owner will be able to view camera output on monitors in the Main Office of each school and any networked PC running the client software.

9. The output to the monitors may be configured for full or split screen or for random scan of all cameras. In the case where a camera is set to record on motion it will automatically go to full screen on a selected monitor(s).

10. The video will be viewable in on any PC equipped with the client software.

1.5 CODES AND STANDARDS

A. Design and operation of the Network based CCTV System shall conform to the following referenced codes, regulations and standards as applicable:

1. National Electrical Code (NEC)

2. UL 294 Access Control Systems

3. UL 1076 Line Supervision

4. FCC Rules and Regulations

5. Part 15, Radio Frequency Devices

6. National Electrical Manufacturers Association (NEMA)

7. Applicable Federal, State and Local laws, regulations, codes

1.6 QUALITY ASSURANCE

A. Manufacturer: Manufacturers shall have been in business for a minimum of five years and must guarantee that spare parts will be carried for a minimum of 5 years.

B. The installer must be a company specializing in CCTV Systems with a minimum of five years' experience. The installer must have personnel authorized by the system manufacturers. The installer may be a sub-contractor to the electrical contractor.

C. If the installer is a sub-contractor, the wiring and physical equipment installation may be done by the electrical contractor, under the supervision of the qualified sub-contractor. All system programming, configuration, testing and commissioning must be done by the qualified installer's manufacturer certified personnel.

1.7 SUBMITTALS

A. Contractor shall submit on all products listed in this specification section, this shall include the following:

1. Model numbers of all components furnished on the job

2. Manufacturer's catalog data sheets for all components

B. Complete engineered drawings indicating:

1. Point-to-point wiring diagrams for all devices

2. Termination details for all devices

3. Single-line system schematic representing the entire system.

2.0 PART 2 – PRODUCTS

2.1 NETWORK VIDEO RECORDER (NVR)

A. Existing to remain Avigilon server.

2.2 IP CAMERAS

A. Type A Camera (Indoor Recessed Dome Camera)

1. Cybersecurity compliant: onboard FIPS 140-2 level 3 compliant TPM and Secure Boot

2. Image Sensor: Progressive scan RGB CMOS 1/1.8”

3. Lens: Varifocal 4.4-9.3 mm; horizontal view (16:9) 47° – 111°; vertical view (16:9) 26° – 57°

4. Max. Aperature: F1.3

5. Minimum illumination w/out IR lights on: 0.002 lux in monochrome mode; 0.006 lux in color mode

6. IR Illumination Max Distance (high power 850 nm LEDs): 50 m (164 ft) full tele at 4MP; 25 m (82 ft) full wide at 8MP

7. ONVIF® compliance Profile S, Profile T, Profile M and Profile G

8. Shutter time: Automatic, Manual (1/7.5 to 1/15000 sec)

9. Camera Angle Adjustment: Pan 360°, Azimuth 349°, Tilt 92°

10. Video Compression: H.264 HDSM SmartCodec, H.265 HDSM SmartCodec, Motion JPEG

11. Up to 8 Megapixel Resolution (16:9) 3840 x 2160

    a. Up to 30 frames per second (fps) at 5 Megapixel Resolution

12. Video Streaming: Multiple, individually configurable streams in H.264 and Motion JPEG, Controllable frame rate and bandwidth, VBR/CBR H.264

13. Image Settings: Compression, color, brightness, sharpness, contrast, white balance, exposure control, exposure zones, backlight compensation, fine tuning of behavior at low light, wide dynamic range – dynamic contrast

14. Auto Focus

15. Mation Detection: Pixel motion: Selectable sensitivity and threshold. Classified object detection

16. Security Access Password protected, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, Digest authentication, User access log

17. Supported Protocols: IPv4/v6, HTTP, HTTPSc, SSL/TLSc, QoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UPnP, SNMPv1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS

18. Power over Ethernet (IEEE 802.3af), 25 Watts (18W with no IR or IR disabled)

19. Onboard Storage: Two microSD/microSDHC/microSDXC slots – video speed class card required. Class V10

20. Service Connector: USB 2.0

21. Die-cast aluminum upper shroud camera housing for indoor surface mounting. Conduit knockouts on top and sides for wiring access. Provide recessed flange upper shroud for mounted to accessible ceilings.

22. Operating Conditions (Indoor): Suitable for operation from (-14°F to 131°F), humidity 10-95% non-condensing

23. Clear polycarbonate dome 360º Horizontal x 30º Vertical capable viewing.

24. Provide Recessed mount kit for drop ceilings.

25. Design Make: Avigilon H6XP Series or Approved Equal

B. Type B Camera (Outdoor Surface Dome Camera)

1. Cybersecurity compliant: onboard FIPS 140-2 level 3 compliant TPM and Secure Boot

2. Image Sensor: Progressive scan RGB CMOS 1/1.8”

3. Lens: Varifocal 10.9 - 29 mm; horizontal view (16:9) 15° – 42°; vertical view (16:9) 9° – 23°

4. Max. Aperature: F1.7

5. Minimum illumination w/out IR lights on: 0.003 lux in monochrome mode; 0.008 lux in color mode

6. IR Illumination Max Distance (high power 850 nm LEDs): 70 m (230 ft) full tele at 4MP; 25 m; 40 m (131 ft) full wide at 8MP

7. ONVIF® compliance Profile S, Profile T, Profile M and Profile G

8. Shutter time: Automatic, Manual (1/7.5 to 1/15000 sec)

9. Camera Angle Adjustment: Pan 360°, Azimuth 349°, Tilt 92°

10. Video Compression: H.264 HDSM SmartCodec, H.265 HDSM SmartCodec, Motion JPEG

11. Up to 8 Megapixel Resolution (16:9) 3840 x 2160

    a. Up to 30 frames per second (fps) at 5 Megapixel Resolution

12. Video Streaming: Multiple, individually configurable streams in H.264 and Motion JPEG, Controllable frame rate and bandwidth, VBR/CBR H.264

13. Image Settings: Compression, color, brightness, sharpness, contrast, white balance, exposure control, exposure zones, backlight compensation, fine tuning of behavior at low light, wide dynamic range – dynamic contrast

14. Auto Focus

15. Mation Detection: Pixel motion: Selectable sensitivity and threshold. Classified object detection

16. Security Access Password protected, IP address filtering, HTTPS encryption, IEEE 802.1X network access control, Digest authentication, User access log

17. Supported Protocols: IPv4/v6, HTTP, HTTPSc, SSL/TLSc, QoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UPnP, SNMPv1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS

18. Power over Ethernet (IEEE 802.3af), 25 Watts (18W with no IR or IR disabled)

19. Onboard Storage: Two microSD/microSDHC/microSDXC slots – video speed class card required. Class V10

20. Service Connector: USB 2.0

21. Die-cast aluminum upper shroud camera housing for indoor surface mounting. Conduit knockouts on top and sides for wiring access. Provide recessed flange upper shroud for mounted to accessible ceilings.

22. Operating Conditions (Indoor): Suitable for operation from (-14°F to 131°F), humidity 10-95% non-condensing

23. Clear polycarbonate dome 360º Horizontal x 30º Vertical capable viewing.

24. Provide Surface mount dome box, vandal resistant.

25. Design Make: Avigilon H6XP Series or Approved Equal

2.3 VIDEO CABLING

A. Refer to section 271000 - Horizontal and Backbone Communication Cabling for 100 Ohm UTP cable (Category 6 cable) and termination requirements.

3.0 PART 3 – EXECUTION

3.1 GENERAL INSTALLATION

A. Prior to installing any equipment the contractor shall walk the buildings with the engineer and District personnel to determine acceptable pathways, installation methods and final locations of equipment. Installation methods that are not approved will be subject to removal and reinstallation at no additional cost to the owner.

B. Installation of the IP based CCTV system shall include the appropriate equipment and shall be performed by a factory-trained Installer. The installation shall be completed to meet the requirements of this specification and the project drawings. The installation shall include the following:

1. Site planning and system configuration of field hardware.

2. Complete hardware setup of all system Workstations and peripherals.

3. Setup of specific network software configuration requirements.

4. Complete system diagnostics verification.

5. Complete system operation verification.

C. Comply with manufacturer's instructions and recommendations for installation of product in the applications indicated. Anchor products securely in place, accurately located and aligned with other work.

D. The Contractor is responsible to remedy defects due to faulty workmanship and materials that appear within one year from the date of acceptance in accordance with the General Conditions, unless Specifications specify a different duration.

3.2 NETWORK VIDEO SERVER/RECORDER

A. Connect VGA output on the NVR to the local 17" LCD monitor in the same rack.

B. Provide typed sticky back label wrapped around each cable identifying the camera location and type. Example "Two Story Vestibule - Wall Mount Camera".

C. Provide all software required for a complete video monitoring and archiving system over the owner's Ethernet LAN. Configure the monitoring software on client workstations with a desktop icon for each CCTV camera.

D. The Contractor and system vendor's qualified representative shall meet with the owner as many times as necessary to finalize system programming. The installer shall review the owner's security plans and policies and make programming decisions based on that plan. The owner shall choose the camera flip or multiple images display settings on the remote LCD Monitor.

E. Provide installation and setup of remote viewing software for owner furnished workstations connected to the owners LAN. Verify all cameras can be connected to and viewed and all PTZ controls function properly. Uninstall and remove any existing not used DVR or NVR viewing clients.

F. The installer shall make changes to the initial system programming for up to 60 days after the initial installation at no additional cost.

G. Import and configure video recording and viewing form all network connected encoders.

3.3 CAMERAS

A. Provide cat. 6 cable for IP connection from each camera back to CER. Provide PoE extender in-line for all cable runs over 300-feet. Use of PoE extenders shall be approved by engineer in advance.

B. The final aiming, focusing and lens selection of cameras shall be done by the system vendor's qualified representative in conjunction with the engineer.

C. Aim and focus cameras initially and test the system. Re-aim and focus the cameras as necessary to the owner's satisfaction.

D. Coordinate all final camera locations in interior and exterior locations prior to rough-in with the owner.

E. Field verify required mounting brackets for exterior cameras. The exact mounting hardware will be determined by the required field of view.

3.4 WIRING, RACEWAYS AND CABLE

A. Provide a category 6 patch cable from NVR to the Ethernet Switch.

B. All power wiring shall be installed in raceway and is to be installed in accordance with Local and National Electrical Codes.

C. All video wiring within accessible unfinished areas (ceilings, mechanical spaces, and crawl spaces) may be run exposed with proper support with bridle rings. Bridle rings shall be installed a minimum of 4 ft. on center.

D. Provide V700 surface metal raceway and associated fittings in finished areas across non-accessible masonry walls. All surface raceway in finished areas shall be painted to match adjacent surface finish.

E. Wiring shall be run parallel and perpendicular to building lines in a neat and workmanlike manner and bundled with nylon tie wraps.

F. Provide conduit sleeves, with applicable fire-proofing through any concrete or block walls for low voltage cable routing.

G. All low voltage cable shall be run in separate raceways from public address or 120V or higher branch circuiting.

H. All exposed wiring shall be installed a minimum of three (3) inches from hot water, steam, or condensate piping.

I. Raceways containing video cabling to exterior cameras shall be concealed inside of buildings.

3.5 SYSTEM ACCEPTANCE TEST

A. Provide demonstration, in the presents of the owners representatives, showing the complete operation of entire system functionality.

B. Make all changes required from the punch list generated during initial testing/demonstration. Schedule a second acceptance test/ demonstration with the District. If additional testing is required after the second test/ demonstration, the contractor will reimburse the district and their representatives for their time at a rate of 2 times their expenditure for their actions.

C. Upon final completion of the punch list as determined by the District, the entire systems and associated equipment furnished by the contractor will be subjected to a thirty (30) consecutive day operational test to determine the reliability of the equipment. If the results of this operational test are acceptable to the district the warranty period will begin.

D. If any part of the system fails during the (30) thirty consecutive days, the contractor will resolve the problems and start the test again beginning with day one. The contractor will be given two (2) opportunities to successfully complete the 30 consecutive day operational testing period.

E. The performance of the entire system will not be less than 100% during the operational 30 consecutive day test period. 100% performance is defined as no trouble reports attributed to the system or contractor’s actions during the acceptance period. The district may add other requirements to the Standard of Performance, as it deems necessary.

F. The system will not be accepted for operational use and final payment will not be authorized until the district determines that the entire system is deemed acceptable.

G. In the event that the entire system (including any special or optional features ordered and installed) have not achieved the Standard of Performance within the two 30 (thirty) day periods, the District may terminate the tests, at its option, and require the contractor to provide a complete system replacement of its choice at no additional cost to the district.

H. In this case the reference to “system” or “entire system” means all equipment at all buildings are complete and fully functional. Final acceptance will not be done one building at a time.

3.6 SYSTEM DOCUMENTATION

A. Complete documentation shall be provided with the system. The documentation shall completely describe all operations, each program, data sets and the hardware and peripherals. All updates, addendum and adjustments to the documentation shall be provided at no additional charge, in the same quantities as originally required.

B. System Administrator Manual - Overview and step by step guide and instructions detailing all System Administrator responsibility and authority.

C. User Manual - Step by step guide and instructions detailing all system user functions and responsibilities.

D. Technical Maintenance Manual - Shall be a comprehensive and detailed document providing all maintenance action, system testing schedules, troubleshooting flowcharts, functional system layout and block diagrams and schematic diagrams of all system wiring.

3.7 SYSTEM TRAINING

A. Provide at least two owner selected representatives with a (2) separate four hour hands on training session that details recording, playback, archiving features of the software package and troubleshooting of the CCTV cameras and recording equipment. All attendees shall be recorded on a sign-in sheet with the data. The sign-in sheet shall be included with the final O&M manuals. Training session shall occur on separate days.

B. Provide an additional 2-hour follow up training course after the accepted thirty consecutive day acceptance period.

C. Notify the owners representatives of when the training course are scheduled and included a copy of the attendee sign in sheet in the O&M Manuals.

3.8 WARRANTY

A. The Contractor shall warrant all labor, workmanship and materials for a period of one (1) year from the date of final acceptance. Should a failure occur within the first year to the access control system, the Contractor shall provide all labor and materials necessary to restore the system to a complete operating condition, at no cost to the Owner.

B. The contractor affix a card with their Company name and phone number to the NVR.

END OF SECTION 282319

SECTION 283110 - FIRE DETECTION AND ALARM SYSTEM WITH VOICE EVACUATION

1.0 PART 1 – GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.

1.2 BASIS OF DESIGN:

A. North Syracuse CSD has an existing Board Resolution on manufacturer standardization. All new Fire Alarm System hardware shall be the Honeywell Gamewell E3 product line. The equipment in this specification shall be provided without substitution.

B. Acceptable Manufacturers: Notifier NFS2-3030 Intelligent Fire Alarm Control Panel

1.3 SCOPE OF WORK

A. During the periods of active construction, within the project area, the contractor shall remove any and all existing smoke detectors and provide temporary heat detectors in their place. Upon completion of construction new detectors shall be provided at these locations. Refer to floor plans for additional information.

B. During the periods of active construction, within the project area, the contractor shall remove all existing smoke detectors and provide temporary heat detectors in their place. Upon completion of construction new detectors shall be provided at these locations. Refer to floor plans for additional information.

C. Provide interconnection input/output wiring to the Emergency Communications System, Fire Alarm System, and Access Control System.

D. Allen Road Elementary School - Disconnect and remove the existing FCI 7200 Fire Alarm Control Panel and all connected wiring, initiation devices, and audible & visual notification devices. Provide Point Addressable Fire Alam System with Voice Evacuation as specified in this section and called for on the drawings.

E. Roxboro Elementary School - Disconnect and remove the existing FCI 7200 Fire Alarm Control Panel and all connected wiring, initiation devices, and audible & visual notification devices. Provide Point Addressable Fire Alam System with Voice Evacuation as specified in this section and called for on the drawings.

F. Roxboro Middle School - Disconnect and remove the existing Notifier Fire Alarm Control Panel and all connected wiring, initiation devices, and audible & visual notification devices. Provide Point Addressable Fire Alam System with Voice Evacuation as specified in this section and called for on the drawings.

G. District Office - Disconnect and remove the existing Simplex 4010 Fire Alarm Control

Panel and all connected wiring, initiation devices, and audible & visual notification devices. Provide Point Addressable Fire Alam System with Voice Evacuation as specified in this section and called for on the drawings.

H. CNS High School – There are two fire alarm control panels in this facility. They currently installed to cross trip each other. Disconnect and remove the existing Notifier 5000 Fire Alarm Control Panel and all connected wiring, initiation devices, and audible & visual notification devices providing fire alarm coverage to the original high school. The new pool addition currently under construction includes a Gamewell E3 Fire Alarm Control panel providing fire alarm initiation and voice evacuation notification. All new fire alarm system work shall be connected to the new Honeywell Gamewell E3 Fire Alarm System. Provide network node expansion and an additional Gamwell E3 Fire Alarm Control Panels as required to provide fire alarm initiation and voice evacuation notification to the original high school for the area previously covered by the removed Notifier FACP.

I. Gillette Road Middle School: Disconnect and remove the existing Notifier NFS-3030D Fire Alarm System Control Panels, Remote Annunciator Panels, Notification Appliance Circuit Panels, all associated initiation device circuit wiring, notification device circuit wring, all initiation and notification devices back to source. Modify and extend the existing telephone lines from the existing digital communicator to the new digital communicator. Program new digital communicator to communicate with districts existing Central Monitoring Agency. Provide Point Addressable Fire Alam System with Voice Evacuation as specified in this section and called for on the drawings.

J. Provide finished red matching surface backboxes for all wall mounted Notification Appliances.

K. Provide installed spare devices as listed in this section to be turned over at the end of the project to the owner.

L. This section includes minimum requirements for the following:

1. Fire Alarm Control Panel
2. Network Node Fire Alarm Panel
3. Notification Appliance Circuit Extender Panels
4. Remote Annunciator Panels
5. Addressable Input Modules (Monitor)
6. Addressable Output Modules (Control)
7. Carbon Monoxide Detectors
8. Manual Pull Stations
9. Smoke Detectors
10. Duct Type Smoke Detectors
11. Heat Detectors
12. Large Venue Speakers
13. Audible Notification Appliances (Speakers)
14. Audible/Visual Notification Appliances (Speaker/Strobes)
15. Visual Notification Appliances
16. Carbon Monoxide Visual Notification Appliances
17. Projected Beam Smoke Detector
18. Magnetic Door Hold Opens

19. Batteries and Charger
20. Digital Communicator
21. Fire Alarm Terminal Cabinet

1.4 INSTALLED SPARE DEVICES

A. Provide the following spare devices installed as directed by the architect and engineer. Installation includes 50-feet of required wiring in a metal raceway system and programming. All unused devices shall be turned over to the owner at project closeout. Include sign off receipt of all devices and quantities turned over to the owner with O&M manuals.

1. (20) Photoelectric Smoke Detectors
2. (5) Duct Smoke Detector
3. (12) 3” extension arms for the Electromagnetic Fire Door Hold Opens
4. (10) Heat Detectors (rate of rise w/ 190-degree fixed temp. setting)
5. (6) Carbon Monoxide Detectors
6. (10) Wall Mounted Combination Speaker/Strobe Notification Appliances
7. (20) Visual Strobe Notification Appliances
8. (10) Addressable Input Modules (Monitor)
9. (20) Addressable Output Modules (Control)

1.5 QUALITY ASSURANCE

A. All raceways shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. The fire alarm system contractor shall be a NYS licensed fire alarm installer.

C. Materials specified herein shall comply with the applicable requirements of

1. The following Articles of the National Electric Code (NFPA 70)

a. Article 760 - Fire Alarm Systems

2. The following National Fire Protection Agency (NFPA) standards:

a. NFPA 72 - National Fire Alarm Code
b. NFPA 101 - Life Safety Code

3. Latest adopted edition of the NYS Building Code

4. Latest adopted edition of the NYS Mechanical Code

5. The following U.L. Standards:

a. UL 864/UOJZ,APOU - Control Units for Fire Protective Signaling Systems
b. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
c. UL 268A - Smoke Detectors for Duct Applications
d. UL 521 - Heat Detectors for Fire Protective Signaling Systems
e. UL 228 - Door Holders for Fire Protective Signaling Systems
f. UL 464 - Audible Signaling Appliances
g. UL 1638 - Visual Signaling Appliances
h. UL 38 - Manually Activated Signaling Boxes
i. UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
j. UL 1481 - Power Supplies for Fire Protective Signaling Systems

1.6 SUBMITTALS

A. Provide standard product data for all equipment indicating the type, size, rating, style, catalog number, and listing of the equipment and quantities.

B. Provide calculations for sizing all batteries and power supplies. The calculations shall include a listing of current used by all current consuming devices in both the standby and alarm mode on each circuit. Provide voltage drop calculations indicating acceptable minimum end of line voltage for the specific equipment used.

C. Provide a complete riser diagram indicating types of devices, number of initiation and signal loop circuits, class of wiring system, and type of wiring and listing for indoor and outdoor use. Include candela and dB level for all notification devices on riser.

D. Architectural floor plans and drawings showing system details including specific location of FACP, all system devices, device ID label addresses, raceway sizes, raceways routings cabling in raceways, end of line devices, power supplies and any other system components.

E. Provide a complete riser diagram indicating all devices with addresses, number of initiation and signal loop circuits, class of wiring system, and type of wiring.

1.7 SYSTEM DESCRIPTION

A. Point addressable network capable fire alarm system with manual and automatic initiation devices. The system shall allow individual alarm and real-time status device level communication back to all other fire alarm panel(s).

B. System shall be supervised to continuously monitor the integrity of the circuit conductors and power supplies.

C. Performance of the fire alarm system circuits shall be in accordance with Class B operation for Initiating Device Circuits (IDC) and Class B operation for Notification Appliance Circuits (NAC’s).

D. The fire alarm control panel shall permit on-site programming to accommodate facility expansions, renovations, or fire alarm system modifications. All memory shall be non-volatile.

E. The control panel shall have 24 VDC output power supplies for notification appliance circuits and sprinkler system activation bell. System shall be capable of adding additional power supplies as required to power all notification appliances.

F. Summary Reports:

1. The Fire Alarm Control Panel shall be capable of displaying and printing summary reports. The summary reports shall include:

a. A list of all alarm points not in their normal state.
b. A list of all points in the system, including their current status.
c. A list of data for all control by event programs.
d. A list of data for all time initiated programs.

G. Alarm Priority:

1. Alarms shall be processed at three levels of priority:

a. Fire alarms shall have the highest priority.
b. Other alarms that require interaction by the attendant shall have the second level of priority.
c. Monitored points which do not require interaction by the attendant shall be the lowest level of priority.

H. System Access:

1. Access to the system shall be controlled by at least three levels of security to prevent programming modifications by unauthorized personnel.

a. The lowest level of access, shall permit the attendant to view the system display, print alarms and perform life safety control by event functions. The Attendant has minimal access to the system functions.
b. The mid-level access shall permit the attendant to change user programmable parameters.
c. The highest level of access shall permit the modification of system software. This level shall be accessed only by a qualified representative of the equipment manufacturer.

1.8 SEQUENCE OF OPERATION

A. Upon an abnormal condition on the fire alarm system, the appropriate LED (alarm, supervisory, or trouble) shall flash. The panel audible alarm shall pulse for alarm conditions and sound steadily for trouble or supervisory conditions. All abnormal events shall be logged into the database, along with the date and time.

B. For the purposes of this specification section audible base smoke detectors and listed fire alarm speaker devices are considered audible signal devices.

C. For the purposes of this specification visual strobes or combination speaker/strobes are considered visual devices.

D. Voice Evacuation System:

1. Each listed fire alarm speaker shall be connected back to the network voice evacuation system. It shall be programmed and connected so a single pre-recorded or live message can be transmitted from a fire alarm panel or fire fighter telephone to all connected fire alarm speakers or specific buildings or units where partial alarms are provided as part of the sequence of operation.
2. Each voice amplifier shall be listed with the FACP to provide visual strobe and audible fire alarm notification and voice instruction.
3. Each continuous building audio booster panel(s) shall be connected so they can provide Fire Alarm notification to its individual continuous building.
4. The Fire Alarm System shall have the highest priority and take-over in the event the Mass Notification System is providing audio input.
5. Upon activation of the Voice Evacuation System within every building, during manual notification a “Supervisory Condition” shall be indicated in the FACP of the corresponding building. When the activation is cleared the FACP shall indicate “Normal Condition”.
6. A microphone located in the fire alarm control panel and any indicated remote annunciator panels with microphone shall be capable of manual live audio message broadcast to the voice evacuation system.

E. Operation of any single smoke detector, heat detector, or manual pull station in shall cause the following to happen:

1. Signal a general alarm condition at the fire alarm control panel. Exterior building mounted sprinkler alarm bell shall operate only upon activation of any system flow switch and shall not operate upon building general alarm.
2. Activate the Voice Evacuation System and connected NAC panels to sound all audible and visual alarm signal devices throughout the continuous building in a temporal code or with voice instructions until silenced at the FACP.
3. Display the points in alarm on the LCD display at the fire alarm control panel, network nodes, and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.
4. Notify the UL listed central station via dial up digital communicator.
5. Operate alarm relay contacts to initiate the elevator recall sequence and trip the “blinking fire hat” notification light in the elevator car.
6. Operate the fan shut-down relay for the HVAC systems in the same smoke compartment or smoke zone.
7. Operate all smoke dampers in the same smoke compartment or smoke zone. Dampers shall close 30 seconds after their respective fan systems have shut down.
8. Release all doors on magnetic hold opens.
9. Subsequent initiating alarms shall repeat the respective sequence of operations.

F. Operation of any single heat detector in unoccupied spaces (mechanical or storage rooms) or operation of more than one alarm initiating device(s) in any building shall cause the following to happen.

1. Signal a general alarm condition at the fire alarm control panel.
2. Activate the Voice Evacuation System and connected NAC panels to sound all audible and visual alarm signal devices throughout the continuous building in a temporal code or with voice instructions until silenced at the FACP.
3. Display the points in alarm on the LCD display at the fire alarm control panel, network nodes, and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.
4. Notify the UL listed central station via dial up digital communicator.
5. Release all doors on magnetic hold opens.
6. Subsequent initiating alarms shall repeat the respective sequence of operations.

G. Operation of any carbon monoxide detector shall cause the following to happen:

1. Signal a supervisory signal only at the fire alarm control panel and remote annunciator.
2. All carbon monoxide detectors throughout the housing building shall provide activation of a distinct carbon monoxide detector audible code within the same continuous floor. Activate all connected carbon monoxide visual notification appliances.
3. Display the points in alarm on the LCD display at the fire alarm control panel, network nodes, and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.
4. Notify the UL listed central station via dial up digital communicator.
5. Release all doors on magnetic hold opens.
6. Subsequent supervisory alarms shall repeat the respective sequence of operations.

H. Elevator Lobby, Machine Room, and Hoistway Smoke Detectors

1. Initiation of any smoke detector within the elevator lobby or machine room will cause the general alarm activating and/or sound all audible and visual alarm signal devices throughout the continuous building in a temporal code until silenced at the FACP.
2. Initiation of any smoke detector within the elevator machine room will initiate elevator car flashing fire hat operation.
3. Initiation of any heat detector in the elevator shaft or machine room shall operate an addressable output relay and trip the shunt-trip circuit breaker feeding the elevator.
4. Notify the UL listed central station via dial up digital communicator.
5. Upon activation the elevator car shall report by default to Primary Floor or to programmed alternate floor other than that of the initiated detector or device.
6. The elevator controller, upon activation of the smoke detector in the hoistway or elevator machine room only, shall automatically initialize the elevator capture, flashing fire fighter hat, open the elevator car door and render the elevator inoperable until the system is reset or overridden by fire department or authorized personal.
7. Initiation of any smoke detector within the elevator hoist way or shaft will cause the activating of the shaft smoke hatch.

8. Release all doors on magnetic hold opens.

I. Operation of any sprinkler system water flow device shall cause the following to happen:

1. Signal a general alarm condition at the fire alarm control panel.
2. Activate the addressable control relay from the fire alarm panel to operate the electric sprinkler system bell on the outside of each building.
3. Display the points in alarm on the LCD display at the fire alarm control panel, network nodes, and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.
4. Notify the UL listed central station via dial up digital communicator.
5. Subsequent water flow alarms shall repeat the respective sequence of operations.

J. Operation of any sprinkler system supervisory device shall cause the following to happen:

1. Signal a supervisory alarm condition at the fire alarm control panel.
2. Display the points in alarm on the LCD display at the fire alarm control panel, network nodes, and at all remote alarm annunciator panels and update the event log. The visual indication shall remain until the alarm condition is reset.
3. Notify the UL listed central station via dial up digital communicator.
4. Subsequent supervisory alarms shall repeat the respective sequence of operations.

K. Synchronize all visual notification appliances (strobes) in the same field of view as per NFPA 72.

L. The Fire Alarm System wiring and power supplies shall be electrically supervised and report trouble conditions to the fire alarm control panel. Any opens, shorts or grounds on the system wiring shall cause the following to happen

1. Sound a distinct pulsed trouble signal at the fire alarm control panel.
2. Flash the yellow common trouble LED.
3. Display the points in alarm on the LCD display at the fire alarm control panel and at all remote alarm annunciator panels. The visual indication shall remain until the alarm condition is reset.
4. Subsequent trouble alarms shall repeat the respective Sequence of Operation.

M. Alarm Silencing:

1. Pressing the “Alarm Silence” button shall cause all audible and visual notification appliances to be deactivated. A yellow LED located in the fire alarm control panel shall illuminate to indicate the alarm has been silenced.

2.0 PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANEL

A. Modular in construction to allow easy expandability for the following components:

1. Amplifiers with multiple voice circuits
2. Addressable signaling line circuits (SLC)
3. Initiating device circuits (IDC)
4. Network communications modules
5. Notification appliance circuits (NAC)
6. Auxiliary control circuits
7. Graphic Annunciator LED.

B. Voice Communication Requirements:

1. Includes Main Local Operating Consol with Voice Gateway to support Voice Amplifiers.
2. The voice communication controller shall be capable of network communication with all other network attached to the fire alarm panels and voice communication panels.
3. Amplifier power can be divided between the two integral Class A/B speaker circuits.
4. The voice gateway contains stored digital messages, microphone messaging, and voice communication input from a UL listed Mass Notification System.
5. Each voice module shall be capable of supporting up to (2) internal 100-watt speaker amplifiers with a 25Vrms or 70Vrms output transformers. Each amplifier shall feature (2) separate addressable speaker channels.
6. Provide amplifier quantities as required to connect all individual buildings on separate audio channels.
7. Provide expansion power supply to allow installation of two dual channel amplifiers in a single Fire Alarm Control Panel cabinet.
8. Local speaker for message verification.
9. Local microphone for live audio paging.

C. Controls shall provide switches to reset, lamp test, walk test, drill, and silence alarm and trouble signals.

D. Indicators shall include power on, system trouble, zone disabled, alarm silenced, alarm, ground fault, and indicating appliance circuit trouble.

E. Provide with a minimum of (4) programmable software defines function buttons, each with label ID field wand LED status indicators.

F. Minimum of (2) additional expansion card slots for future use.

G. LCD Display

1. Membrane construction with 80 character LCD display.
2. Minimum of (3) programmable LEDs.
3. 40 characters reserved for user programmable messages.
4. Four pairs of display keys for selection of event display by type (alarm, supervisory, trouble, or monitor) and forward/backward scrolling through event listing.

H. The control panel shall be completely supervised, site programmable, and have ability to support 159 sensors, 159 modules and 159 addressable sounder bases.

I. Panel shall be network capable to network node expansion panels supporting up to 244 SLCs.

J. All system memory shall be stored in non-volatile memory.

K. The system shall utilize digital communications to supervise all addressable loop devices for placement, correct location, and proper operation.

L. The system shall support distributed processor detectors with the following attributes:

1. 40 character user-defined text per device
2. Automatic device mapping
3. Electronic addressing
4. Environmental compensation
5. Pre-alarm for dirty detectors
6. Automatic day/night sensitivity adjustment

M. Analog addressable initiation (IDC) circuits System circuits and Notification Appliance Circuits (NAC) allowable to be connected as Class A or Class B.

N. Capable of performing a UL listed detector sensitivity test.

O. The power supplies shall be high efficiency, switched mode type, and shall monitor the incoming line. Upon power outage or brownout conditions, the power supplies shall automatically switch to the batteries.

1. The power supply shall provide internal power and 24 VDC for notification appliance circuits.
2. All output circuits shall be power limited.
3. Provide with batteries and charger sized to support the system for 24 hours, and then operate all notification appliances for 15 minutes.

P. 120V input and (2) 2-Amp NAC circuits with strobe synchronization.

Q. Network Repeater: Twisted unshilded pair copper network communication hardware and software, firmware updates, to the most recent version, and programming for communication as indicated above.

R. Enclosure:

1. A single common enclosure shall house the fire alarm controls, voice communication modules, NAC power supply, and cabinet power supply.
2. Surface mounted, steel with RED enamel finish.
3. Hinged, lockable door with viewing window.
4. Sized to house power supplies, batteries, and charger.
5. Cabinet “D” Size: Dimensions: 19 3/8”W x 41”H x 4 1/2”D, Command Center Enclosure.

S. Design Make: Honeywell Gamewell E3

2.2 NETWORK NODE FIRE ALARM PANEL

A. Surface mounted red trim annunciator panel with hinged lockable Plexiglas front door.

B. The new main fire alarm panel in shall connect back to the network head end as shown on the riser.

C. Includes Qty. (2) SLC circuits meeting the same requirement as the Fire Alarm Control Panel in this section.

D. 120V input and (2) 2-Amp NAC circuits with strobe synchronization.

E. Includes Autonomous Control Unit with Voice Gateway including:

1. (2) 100-watt Voice Amplifiers meeting the same requirement as the Fire Alarm Control Panel in this section.

F. Distributed Network Operation: All fire alarm and voice control panels shall be capable of allowing panels to interface each other through a Style 7 (Class A) supervised communication channel.

G. All expansion fire alarm and voice communication panels shall be networked back to the main fire alarm panel in by copper cable and network cards in a redundant self-heling loop.

H. Network Repeater: Twisted unshilded pair copper network communication hardware and software, firmware updates, to the most recent version, and programming for communication as indicated above.

I. Design Make: Honeywell Gamewell E3 w/ RPT-E3-UTP

2.3 NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANELS

A. Shall be compatible with the fire alarm panel and audible and visual notification signal devices.

B. Supervises for power loss, brownout, and batteries, and has power-on and trouble LEDs.

C. Two trip inputs with configurable output correlation.

D. Four independently controlled power-limited output circuits with general alarm operation, available as Class B or Class A. Provides strobe synchronization.

E. Sized to accommodate all devices shown on drawing plus a minimum of 30% spare capacity.

F. Output: 2 Amp per circuit @ 24VDC nominal.

G. Provide with 120VAC power supply, batteries and charger sized to support the system for 24 hours, and then operate all notification appliances for 15 minutes.

H. All equipment mounted in NEMA 1 lockable enclosure.

I. Addressable type when used with addressable notification devices.

J. Design Make: Gamewell E3

2.4 REMOTE ANNUNCIATOR PANELS

A. Surface mounted black trim annunciator panel with hinged lockable Plexiglas front door.

B. Min.8 in. diagonal, 800 x 600 resolution color touch screen display capable of active events without scrolling • Bright white LED backlighting provides efficient and long lasting illumination. The backlight is dim in quiescent state and automatically switches to full power on touch or on event activity in system.

C. Menu-driven format conveniently prompts operators for the next action required. Direct point callup displays individual points alphabetically and then homes in on the logical choice as more point information is entered.

D. Both Hard and Soft keys are available for the following critical functions: Event Acknowledge, Alarm Silence, and Reset Functions.

E. Resistive touchscreen technology allows operation with or without gloves.

F. Network Repeater: Twisted unshilded pair copper network communication hardware and software, firmware updates, to the most recent version, and programming for communication as indicated above.

G. Includes Main Local Operating Consol with Voice Gateway and local microphone for live audio paging.

H. Provide with a minimum of (4) programmable software defines function buttons, each with label ID field wand LED status indicators.

I. Provide with necessary flush or surface mounted backboxes and 24Volt power supply.

J. Design Make: Gamewell E3

2.5 ADDRESSABLE INPUT MODULES (MONITOR)

A. Single Style B, Class B initiating device circuit (IDC) with end-of-line resistor. This module provides an address for any device or group of devices connected to this circuit on the signaling line circuit (SLC) of the fire alarm control panel. Any initiating device with normally open (N.O.) dry contacts may be made addressable when connected.

B. Electronic point addressing to indicate the unique description and location regarding the device status and alarm condition.

C. Input circuit wiring requirements

1. Maximum allowable wire resistance - 50 ohms per circuit
2. Maximum allowable wire capacitance - .1uF per circuit

D. Polling and alarm/active status provided by on board red and green LEDs.

E. Design Make: Gamewell AMM-2F or Approved Equal

2.6 ADDRESSABLE OUTPUT MODULES (CONTROL)

A. Addressable device with a form “C” dry relay contact used to control external appliances such as door closers, fans, dampers etc.

B. Electronic point addressing to indicate the unique description and location regarding the device status and alarm condition.

C. Provide a remote LED alarm and key operated test switch for each damper connection. Install remote test switches in visible (below ceiling space) and accessible locations adjacent each damper.

D. Relay contact rating:

1. 24 VDC = 2amps (pilot duty)
2. 120 Vac = .5 amps

E. Polling and alarm/active status provided by on board red and green LEDs.

F. Design Make: Gamewell Velociti® Series AOM-2SF

2.7 CARBON MONOXIDE DETECTORS

A. The FACP shall receive separate trouble status, current threshold conditions, and alarms from the carbon monoxide, smoke or heat detectors.

B. Flush mounts over a standard 4”x4” two-gang backbox.

C. Audible alarm for carbon monoxide signal shall be different than smoke alarm signal.

D. Single analog addressable consumes only one address. Carbon monoxide detector receive both communications and sensor power from the FACP battery backed power source.

E. Alarm conditions shall be indicated by a steady red glow from the LED mounted on the sensor.

F. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring. The detector shall be tamper resistant and shall be removable only with a special tool.

G. Carbon monoxide detector may be standalone where provided with a dedicated addressable input module or mounted with a listed combination smoke or heat sensor base. Combination systems shall be listed in accordance with UL 2075 and UL 268.

H. Includes carbon monoxide gas warning module (temporal code 4) for a repeated sequence of four cycles of 100 msec on with 100 msec off, followed by 5 seconds off per NFPA 720, Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units.

I. UL 2034 Carbon monoxide alarm detection.

J. Design Make: Gamewell E3

2.8 MANUAL PULL STATIONS

A. Semi-flush, dual-action type.

B. High impact red housing with contrasting white “Pull for Fire” lettering.

C. Upon activation, handle shall lock in the alarm condition. A key shall be required to reset the manual pull station. Cylinders shall be keyed to match the fire alarm control panel.

D. Electronic point addressing to indicate the unique description and location regarding the device status and alarm condition.

E. Provide with Lexan guard shield for installations in Gyms, pools, and where indicated on drawings, Design Make: STI STOPPER II

F. Manul Pull Station Design Make: Gamewell MS-7AF

2.9 SMOKE DETECTORS

A. Detector shall operate on a light scattering principal. The detector shall have a photo-optic chamber with an infrared light emitting diode and a high speed light sensing photo diode. Capable of sensing visible products of combustion.

B. Alarm conditions shall be indicated by a steady red glow from the LED mounted on the sensor.

C. Electronic point addressing to indicate the unique description and location regarding the device status and alarm condition.

D. The sensor shall be continuously monitored to measure any changes in sensitivity due to dirt, smoke or humidity. Any buildup of foreign material shall cause trouble signal at the control panel indicating that maintenance is required.

E. Sensor shall be capable of automatic device mapping and day/night sensitivity adjustment.

F. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring.

G. Provide wire guards as shown on plans.

H. Provide auxiliary relays and 24 VDC power for elevator capture or smoke evacuation control where indicated.

I. Design Make: Gamewell Velociti® Series 3

2.10 DUCT TYPE SMOKE DETECTORS

A. Smoke detector shall be solid state, unipolar type with dual chamber construction and operate on the ionization principle.

B. Capable of detecting both visible and non-visible products of combustion.

C. Self-compensating circuitry to provide stability against aging and dust.

D. Sensor shall be microprocessor based, with electronic point addressing to indicate the unique description and location regarding the device status and alarm condition.

E. Field adjustable sensitivity pre-set in the factory.

F. Enclosure suitable for mounting on an air duct, with a sampling tube that extends into the duct air stream.

G. Suitable for installation within an air-duct system with air velocities from 300-4,000 feet per minute.

H. Provide a remote LED alarm and key operated test switch for each duct smoke detector. Install remote test switches in visible (below ceiling space) and accessible locations adjacent each duct smoke detector.

I. Design Make: Gamewell Innovair Flex-DNR Series detector and RTS151KEY UL S2522 and remote key test station.

2.11 HEAT DETECTORS

A. Self-restoring thermal detector.

B. Sensors heat detection thresholds and setpoints shall be remote programmable, with electronic point addressing to indicate the unique description and location regarding the device status and alarm condition.

C. Rated at 135°F (or as indicated on drawings) fixed temperature. Provide 190°F fixed temperature in boiler rooms, kitchens and where indicated on plans.

D. Sensors shall be twist lock mounted to a separate base provided with screw terminals for field wiring.

E. Design Make: Gamewell Velociti® Series 3

2.12 LARGE VENUE SPEAKERS

A. Shall be compatible with the Fire Alarm System and any connected UL listed Mass Notification System.

B. Surface mount speaker w/ adjustable tilt universal bracket.

C. 9” diameter horn, 4.5 lbs, red housing with white text wording “FIRE”

D. Power Output selectable 25/70 Volts: Taps settings 0.9W, 1.8W, 3.8W, 7.5W, 15.0W

E. The horn shall have a dispersion of 70 degrees.

F. Wide frequency range: 400 Hz – 7 kHz, optimized for human voice. Crystal-clear voice and high impact tones.

G. Acoustic Output:

1. 0.9 Watt Tap @ 10-feet - 90dB
2. 1.8 Watt Tap @ 10-feet - 93 dB
3. 3.8 Watt Tap @ 10-feet - 96 dB

H. UL 1480 and ULC S541 listed.

I. Weather-resistant, vandal resistant aluminum construction assures protection against water, humidity and corrosion.

J. Ambient operating temperature range: -31°F to 150°F.

K. Provide wire guards as shown on plans.

L. Design Make: Wheelock STH-15SR

2.13 CEILING MOUNTED AUDIBLE NOTIFICATION APPLIANCES (SPEAKERS)

A. Shall be compatible with the Voice Communications Control Panel.

B. Provide back box and tile bridge for ceiling recessed installations.

C. Operate on a 25 VRMS or 70.7 VRMS.

D. Provide with a line supervisory capacitor.

E. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

F. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

G. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

H. Speaker shall be 4-inch, 8 ohms impedance.

I. White housing with red text reading “FIRE”.

J. Design Make: Gamewell E3

2.14 WALL MOUNTED AUDIBLE NOTIFICATION APPLIANCES (SPEAKERS)

A. Provide back box for recessed installation except for installations on existing walls.

B. Audible speaker shall have the following characteristics:

1. Shall be compatible with the Voice Communications Control Panel.

2. Operate on a 25 VRMS or 70.7 VRMS.

3. Provide with a line supervisory capacitor.

4. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

5. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

6. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

7. Speaker shall be 4-inch, 8 ohms impedance.

C. High impact red housing with clear lens and contrasting white "FIRE" lettering.

D. Provide with wire guard where noted on plans.

E. Design Make: Gamewell E3

2.15 CEILING MOUNTED AUDIBLE/VISUAL NOTIFICATION APPLIANCES (SPEAKER/STROBES)

A. Shall be compatible with the Voice Communications Control Panel.

B. Provide back box and tile bridge for ceiling recessed installations.

C. Audible speaker shall have the following characteristics:

1. Operate on a 25 VRMS or 70.7 VRMS.

2. Provide with a line supervisory capacitor.

3. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

4. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

5. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

6. Speaker shall be 4-inch, 8 ohms impedance.

D. Visual strobe shall have the following characteristics:

1. ADA compliant.

2. White light output of 15, 30, or 75 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

E. White housing with clear lens and contrasting red “FIRE” lettering on two sides.

F. Design Make: Gamewell E3

2.16 WALL MOUNTED AUDIBLE/VISUAL NOTIFICATION APPLIANCES (SPEAKER/STROBES)

A. Provide back box for recessed installation except for installations on existing walls.

B. Audible speaker shall have the following characteristics:

1. Shall be compatible with the Voice Communications Control Panel.

2. Operate on a 25 VRMS or 70.7 VRMS.

3. Provide with a line supervisory capacitor.

4. Twisted /shielded wire is required for speaker connections on a standard 25 VRMS or 70.7 VRMS NAC, having a minimum of 3 twists per foot is required for addressable strobe connections.

5. The following taps are available: 0.25W, 0.50W, 1.0W, and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84 dBA at 10 feet.

6. The unit shall have a frequency response of 400 to 4,000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.

7. Speaker shall be 4-inch, 8 ohms impedance.

C. Visual strobe shall have the following characteristics:

1. ADA compliant.

2. White light output of 15, 30, or 75 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. High impact red housing with clear lens and contrasting white “FIRE” lettering.

E. Provide weather resistant model where noted on floor plans.

F. Provide with wire guard where noted on plans.

G. Design Make: Gamewell E3

2.17 CEILING MOUNTED VISUAL NOTIFICATION APPLIANCES

A. Provide back box and tile bridge for ceiling recessed installations.

B. 24 VDC.

C. Visual strobe shall have the following characteristics:

1. ADA compliant.

2. White light output of 15, 30, or 75 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. White housing with clear lens and contrasting red “FIRE” lettering on two sides.

E. Design Make: Gamewell E3

2.18 WALL MOUNTED VISUAL NOTIFICATION APPLIANCES

A. Provide backbox for recessed installations except for installations on existing walls.

B. 24 VDC.

C. Visual strobe shall have the following characteristics

1. ADA compliant.

2. White light output of 15, 75, or 177 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. High impact red housing with clear lens and contrasting white “FIRE” lettering.

E. Provide weather resistant model where noted on floor plans.

F. Provide with wire guard where noted on plans.

G. Design Make: Gamewell E3

2.19 CARBON MONOXIDE VISUAL NOTIFICATION APPLIANCES

A. Provide backbox for recessed installations except for installations on existing walls.

B. 24 VDC.

C. Visual strobe shall have the following characteristics

1. ADA compliant.

2. White light output of 15, 75, or 177 candela.

3. Flash rate from 1 Hz to 3 Hz.

4. Pulse duration of 0.02 seconds.

D. High impact white housing with amber lens and contrasting red “ALERT” lettering.

E. Provide with separate signage with text “CARBON MONOXIDE ALARM”.

F. Design Make: Gamewell E3

2.20 PROJECTED BEAM SMOKE DETECTOR

A. Pulsed infrared beam to prism reflector and back with automatic signal level compensation. Malfunction indicator for signal level constraint errors that exceed compensation threshold values.

B. Coverage distance from transmitter to receiver: 16-feet to 328-feet in straight linear path.

C. Horizontal separation between parallel detectors: 45 feet max.

D. Horizontal distance to end wall of space: 20-feet max.

E. Vertical distance from ceiling: 12-inches up to 24-inches.

F. System includes a transceiver unit and prism reflector located on opposite end of coverage zone. Reflective prism requires no wiring or batteries.

G. Includes built-in status indicator LEDs: Alarm, Trouble, Operating display

H. Three adjustable alarm sensitivity selections

I. Includes remote mounted power supply and test station for installation in accessible location.

J. Separate Alarm and Trouble relays, 2A @ 30VDC contact.

K. Operating voltage 10VDC - 30 VDC

L. Design Make: Bosch FIRERAY 50RV/100RV Series or Approved Equal

2.21 MAGNETIC DOOR HOLDERS

A. Magnetic door holders shall be provided as part of the electrical contract.

B. Provide surface mounted 24VDC or 120 VAC field selectable. Power shall be from separate power supply and not the FACP.

C. Electrical Contractor shall mount and connect all magnetic door holders.

D. 1-gang mountable, 3 5/8" projection depth

E. 316 stainless steel alloy housing with satin aluminum finish

F. Design Make: ASSA ABLOY Rixon 998M, Secutron DH Series or Approved Equal

2.22 DIGITAL COMMUNICATOR

A. The Digital Alarm Communicator Transmitter (DACT) receive system status messages from the host fire alarm control panel and communicate the information over the public telephone network to a Digital Alarm Communications Receiver (DACR) at the central station.

B. Shall have inputs for two telephone lines, which are not required to be "dedicated" to the fire alarm. Equipment shall allow RJ-31X connection to other telecom equipment but have the ability to disconnect of other telecom equipment in case the phone line is in use during an emergency.

C. LED indicators for power and communication line error.

D. Self-testing.

E. Capable of CONTACT ID, SIA110, SIA300, and 4/2 Standard coded output formats to the DACR.

F. Design Make: Per. Fire Alarm System Manufacturer

2.23 BATTERIES AND CHARGER

A. Provide battery and charger to provide 24 VDC standby power for the fire alarm system.

B. Provide sealed lead-acid maintenance free batteries. Size batteries to permit 24 hours under supervisory condition, and then sound all alarms for 15 minutes.

C. Cell reversal protection.

D. 5-year minimum life expectancy.

E. Battery charger shall be self-regulating, solid state type, capable of full charging a deleted battery within five hours.

F. Install battery charger within the fire alarm control panel.

G. Install batteries with fire alarm control panel or in a vented enclosure located adjacent to the fire alarm control panel.

H. Design Make: Per. Fire Alarm System Manufacturer

2.24 FIRE ALARM TERMINAL CABINET

A. Dimensions: 23" wide x 13" high x 5 1/2" deep

B. 16 gauge cold rolled steel construction

C. Durable red textured finish

D. White indelible 2" screened lettering "FIRE ALARM TERMINAL CABINET"

E. Keyed door lock

F. Interior labeling of terminal strips

G. Field identification label inside cover

H. 1/2", 3/4", 1", 1 1/2" and 2" EMT knockout clusters

I. Dual 16-point high barrier terminal strips will accept up to 12 gauge wire

J. Terminal strips rated for 20 amp max 250V (Class B/UL) at 300V

K. Design Make: Space Age Electronics SSU00651 or Approved Equal

3.0 PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. All installations shall be accomplished in a professional manner by qualified personnel regularly engaged in and experienced in this type of Work. All fire alarm installers shall possess a state license for installation of fire alarm systems where required.
2. Labeling of addressable devices to be approved by owner and each addressable device shall be provided with a custom label designation (e.g. M1-44) in black text on an adhesive backed plastic label. Labeling on device to be by Electrical Contractor (EC).
3. During installation and testing, and prior to the system being put into service, all manual stations shall be appropriately marked "NOT IN SERVICE" by the Contractor.
4. Provide all 120-volt, 60 cycle AC required to power the system and all remote power supplies.
5. Wiring to all initiation and signal circuits shall be two wire class B. A fault on a circuit loop shall cause a trouble alarm to initiate at the fire alarm control panel.
6. Initiating device circuits shall be wired class A to line isolators. A fault on a circuit loop shall cause a trouble alarm to initiate for its associated zone at the fire alarm control panel
7. All wiring shall conform to NEC Articles 725 and 760, and to NFPA-72, "National Fire Alarm Code".
8. Detection and initiating equipment shall be listed by UL or approved by FM.
9. Install smoke detectors a minimum of 3 feet away from any air supply or return diffuser.
10. All surface mounted devices shall be mounted on a special box furnished by fire alarm equipment manufacturer. Total assembly shall be secure, smooth contour and have no protrusions.
11. Where detectors are installed on wood or masonry surfaces, attach brackets directly to the surface with tamperproof fasteners. Where detectors are installed on suspended ceilings, provide additional supports in the ceiling, such as channel support system, angle iron or additional runner bars. Fasten the additional supports rigidly to the ceiling runner bar system. Attach bracket to the supports with tamperproof fasteners. Install metal spacers between the bracket and supports so that the ceiling tiles will not be a part of the support system.
12. Mount FACP and all sub panels at working height.
13. Provide additional programming at the FACP for custom LCD messages. All initial programmed messages shall be modified to match the final room/space designation after occupancy has occurred
14. Provide type label adjacent to all programmed LEDs or buttons customized on Fire Alarm Panels. Provide engraved plastic label on each fire alarm panel indicating the building name that will display during annunciation sequences
15. Provide and wire fan shutdown relay contacts in series with starters ahead of all control devices.
16. FACP initiating circuits will be populated leaving at least 20% spare addresses per loop and floor.

17. All FACP or AUXILIARY NAC output circuits shall leave at least 20% spare output power for future expansion
18. Coordinate assignment of ADDRESS LABELS for all reporting points on fire alarm system with the owner.
19. All controlled devices such as smoke dampers, fire dampers, elevator control and door control shall be supervised to within 4’ of the controlled device.

B. Audible/Visible Device Installation:

1. Visual strobes shall be 75-candela output in all other locations unless otherwise noted.
2. Devices shall be installed at eighty inches (80") minimum above the floor, or six inches (6") below the ceiling, whichever is lower, in accordance with ADA guidelines.
3. Audible devices intended for operation in public spaces shall have a sound level of not less than seventy-five (75) dBA at ten feet (10'), nor more than 110 dBA at the minimum hearing distance from the device.
4. Audible devices intended for operation in private spaces shall have a sound level of not less than forty-five (45) dBA at ten feet (10'), nor more than 110 dBA at the minimum hearing distance from the device.
5. All audible emergency alarm signals shall be at least 15 dBA over the existing sound level within a space or shall exceed the maximum sound level by 5 dBA for at least 60 seconds, whichever is louder. Within areas occupied by persons with hearing impairments, audible emergency alarms must have the intensity and frequency to provide notification of an alarm condition.
6. ALL NAC POWER EXTENDERS and other system power supplies shall be approved by FACP manufacturer, support full monitoring and meet all NFPA requirements. Provide required 120-volt branch circuit for proper system operation
7. ALL VISUAL NOTIFICATION APPLIANCES will be synchronized with all others in a given area where 2 or more devices can be viewed simultaneously
8. Do not exceed 80% loading on any NAC power circuit.

C. Voice Evacuation System

1. Program up to four pre-recorded messages.
2. Configure the fire alarm panel and remote annunciator mounted microphone to allow live message broadcast under alarm conditions. The live voice messages shall over-ride any repeating alarm tones.
3. Provide intelligibility testing of the system as outlined in NFPA 72. Adjust tap values as required to achieve speech intelligibility and volume output of audible notification devices.

D. Projected Beam Smoke Detectors:

1. Install at manufacturer recommended clearances from ceiling and obstructions.
2. Do not mount the units so that the beam runs closer than 4 in. (10.2 cm) to the intersection of the wall and the ceiling. For a sloped or peaked ceiling, the beam path should be located within 3 ft (0.9 m) of the ceiling's peak (NFPA 72).
3. Install such that projected beam is clear of moving objects.
4. Provide backbox as required per. manufacturer.

5. Provide with addressable input module.
6. Install remote status indicator in accessible location as approved by owner.
7. Provide 12/24VAC power wiring from FACP as required.

E. Carbon Monoxide Detectors

1. Provide SLC circuit connection, 24V power supply, and necessary relays. Connect SLC circuit to addressable base carbon monoxide detectors from area fire alarm panel per. manufacturer guidelines. Where addressable base CO detectors are not available from fire alarm system manufacturer provide addressable input module connected to conventional UL 2075 and UL 864 Compliant type CO detector.
2. All carbon monoxide detectors shall be interconnected to provide notification thru all other CO devices and any indicated audible or visual strobes.
3. Provide signage identifying the carbon monoxide alarm to notify occupants in event of alarm. Provide adhesive typed label on carbon monoxide detectors with audible alert and carbon monoxide strobes to display the following text "CARBON MONOXIDE ALARM".

F. Wiring:

1. Provide Fire Alarm Wiring Terminal Cabinet on each floor and Wing of the building. Install adjacent to the NAC panel.
2. Install all wiring in accordance with manufacturer's recommendations and the National Electric Code.
3. All wire shall be copper and installed in separate raceway system.
4. All interior wiring shall be installed in a separate metal raceway system or where wiring can be concealed above accessible suspended ceilings, open air fire rated cable with separate cable hangers may be used. Where open air fire rated cable with separate cable hangers are used all wall penetrations shall be sleeved with EMT conduit with bushings and appropriate Fire Sealing. Provide surface raceway in finished areas to conceal exposed wiring. Provide EMT conduit in mechanical rooms, unfinished areas and for all exposed wiring not concealed. Wiring in unoccupied crawl spaces may be open air fire rated cable with separate cable hangers. Paint all junction box covers in the raceway system RED.
5. Do not install speaker wiring in same raceway as initiating device and visual strobe circuit wiring. Provide independent raceway system for all speaker wiring installations.
6. Underground conduit shall be Schedule 40, PVC at twenty-four (24) inches, minimum, below grade. Risers from underground conduits to exterior devices shall be rigid steel. Underground conduits shall be 3/4 inch trade size, minimum. A separate ground wire shall be pulled and properly terminated when PVC conduit is used.
7. Wire and cable shall be #14 AWG size, solid copper, THHN/TWN for horns, manual stations, smoke or heat detectors, waterflow switches, valve supervisory switches and other initiating and indicating devices. Communication loop wiring shall be shielded or accordance with the Manufacturer's recommendations.
8. Wiring shall be continuous from device to device. Splicing shall be accomplished by use of terminal blocks in locked cabinets keyed alike with the fire alarm control unit, or junction boxes. No connections or splices shall be made underground.

9. Control cabinets shall not be used as pull boxes or raceways. Wiring gutters and locked terminal cabinets shall be used.
10. The Fire Alarm System wiring shall be installed in a workmanlike manner, subject to the approval of the project manager.
11. All harnessing of wires shall be accomplished by use of approved nylon tie wraps.
12. All wiring shall be numbered, and color coded in accordance with this Specification and approved submittal drawings.
13. Tests of all wiring shall be conducted for proper connection, continuity, and resistance to ground. The minimum allowable resistance between any two conductors or between conductors and ground is one (1) megohm as checked by a "megger" after all conduit, conductors, detector bases, etc. have been installed, but before the detector devices are plugged into the base or end-of-line devices installed.

G. Routing:

1. All fire alarm system conduits shall be installed either parallel or perpendicular to building structural members.
2. All fire alarm system conduits shall be provided at a height so as not to obstruct any portion of a window, doorway, stairway, or a passageway, and shall not interfere with the operation of any existing mechanical or electrical equipment.
3. All fire alarm system conduits and cable shall be routed to minimize the potential for physical damage, either mechanical or by fire.
4. All fire alarm system conduits, junction boxes and cable shall be concealed where possible.
5. All fire alarm system junction boxes, pull boxes, terminal cabinets, control enclosures and device backboxes shall be readily accessible for testing, service and maintenance.

H. Wall, Floor and Ceiling Penetrations:

1. All conduit penetrations of walls shall be provided with escutcheon plates on either side of the wall.
2. All conduit penetrations of walls, floors, and ceiling shall be sealed around the conduits, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity.

I. Concealment:

1. Conduit shall be concealed except where shown on the drawings.
2. All conduit, raceways, junction boxes, panels, electrical enclosures, relays and device backboxes shall be concealed in ceiling spaces, electrical shafts or closets in all finished areas.
3. Conduit, raceways, junction boxes, panels, electrical enclosures, relays and device backboxes may be exposed in unfinished areas.
4. All fire alarm system components, including devices, junction boxes, electrical enclosures, relays and device backboxes shall be provided so as to be readily accessible for inspection, testing, service and maintenance.

J. Terminations:

1. All fire alarm conductor terminations shall be on numbered terminals or terminal strips. All fire alarm conductor terminations shall be within junction boxes, device backboxes, terminal cabinets, control panels or other satiable metal enclosures. Terminals and terminal strips shall be suitable for the size and number of conductors connected to them.
2. All connections and end-of-line devices shall be accessible for inspection, testing and servicing.
3. Terminations to terminals other than barrier/pressure plate type terminals shall use crimp-on ring-type or Y-type spade connectors.
4. Splices shall be permitted only when routing of existing conductors prohibits point-to-point terminations in existing junction boxes, terminal cabinets, etc. All such splices shall be provided with new terminal strips with proper labeling in junction boxes, terminal cabinets, etc.

K. Control Panel Location and Wiring:

1. Install annunciator panels in locations indicated on the drawings.
2. All control panel wiring shall be fully dressed and bundled with nylon tie wraps. Bundled wiring shall be routed parallel to terminal strips within control panels, with individual conductors turned out at 90 degree angles to their associated terminal connections. AC power conductors shall be bundled and routed separately from low voltage conductors. A minimum 2-inch separation shall be maintained between AC power conductors and low voltage conductors wherever possible. All control cabinets shall be sized to accommodate the requirements of this section.
3. Each conductor terminating within a control panel shall be uniquely numbered with durable plastic tags or uniquely identifiable by a combination of numbers and color codes. These conductor numbers shall be shown on the record (As-Built) drawings in a manner allowing ready identification of any field wiring conductor in any control panel.

L. Mounting and Labeling of Devices:

1. All fire alarm devices shall be rigidly mounted, using appropriate backboxes, to building structural members, permanent walls, ceilings or fixtures designed for the purpose.
2. All devices shall be labeled with device address or device count as appropriate. Label shall be sticky back type attached to base of device. Label identification shall be consistent with As-Built drawings.
3. All addressable control modules shall be labeled with the device being controlled and the location of that device.

M. Color Coding and Wire Numbering:

1. All conductors entering and leaving terminal cabinets and junction boxes shall be numbered in a logical and consecutive manner.
2. All conductors shall be color coded. Color coding shall be by wire insulation, not taping or banding. The numbering and color coding shall be continuous for each circuit wire.

3. Wires shall be numbered at each connection, termination, and junction point. Wire numbering tags shall be Brady Perma-Code, Westline, or equal.
4. Color coding shall be as follows:

CIRCUITS	COLOR CODES
Alarm Initiating Circuits	Yellow (-) and Orange (+), red (alarm) blue (alarm)
Horns, 24VDC	Slate(-) and Brown (+)
Smoke Detector	Yellow (-) Orange (+) red (alarm) blue (alarm)
Heat Detectors, Pull Stations	Purple (alarm) Black (alarm), connected to the same zone
Fan Shutdown	Blue (-) White (+)
Strobes, 24VDC	Violet (-) and Pink (+)
System AC Power	Black and White
Sprinkler Horn	Black and White
Valve Supervision	Orange and Yellow
DC Power, Door holds	Black (-) and Red (+)

3.2 INTERRUPTIONS TO EXISTING FIRE ALARM SYSTEM

A. General:

1. Do not remove any portion of the existing fire alarm system from operation while installing new work without written approval of the Owner's Representative.
2. Pupil occupied spaces must have existing systems maintained during school operation.
3. In order to meet the above requirements, provide temporary wiring and relocations of existing and/or new equipment as required. These temporary locations shall be arranged to maintain the required system coverage.

3.3 TESTING

A. General:

1. After complete installation of the equipment and submittal of as-built drawings, the Contractor shall perform complete tests of the system. After these tests have been completed, the Contractor shall request final acceptance inspection and tests in the presence of the Project Manager and local authority. Coordination of final acceptance test date and times with those to be present is the responsibility of the Contractor. The Contractor shall demonstrate that all conditions of the plans and specifications have been met. The tests shall include proper operation of all devices and testing of supervised circuits. The installation will be checked against the as-built drawings. The Contractor shall furnish all testing materials and instruments. A punch list will be developed and the Contractor shall correct punch list items. There will be a reinspection of punch list items. If additional reinspection's are found necessary to assure compliance with the Contract, they shall be made at the Contractor's expense.

a. The Contractor shall provide, at no additional cost to the Contract price, the following services by the Manufacturer's representative:

1) Prior to the final inspection, "pre-test" the entire fire alarm system to assure that all new equipment is properly installed and functions in accordance with plans and specifications.
2) The Manufacturer's representative shall certify that the entire new and existing installation was tested and performed satisfactorily.

2. Final acceptance tests shall be coordinated by the contractor and performed in the presence of the owner's representative as follows:

a. Operation of the fire alarm control panel and indicating components in accordance with factory recommended procedures.
b. Operational tests of all devices (i.e., detector, waterflow indicator, manual pull box, and valve supervisory device) in accordance with the factory recommended procedures.
c. Audible/visible testing of all indicating appliances. Tests shall include sound level (dBA) and light intensity (lumens). Audible testing shall be performed and documented for each space with any doors closed.
d. Checks of each initiating circuit or device address for correct indications at the control unit, and any remote annunciator.
e. A checkout report shall be prepared by the contractor and submitted to the Owner's Representative. The checkout report shall include a listing of detector sensitivity for each detector. The report shall summarize the results of all tests and shall serve as the contractor's certification that the system is properly installed and fully functioning

B. The complete fire protection system shall be fully tested and guaranteed for a period of one year after Owner's Representative written acceptance.

C. Prior to acceptance testing the contractor shall complete and submit the "Record of Completion" form as identified in NFPA 72.

D. An acceptance test of the complete system shall be conducted by the contractor and fire alarm equipment vendor/installer as directed by the owner after the system has performed a 100% Pre-Test. Submit a written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved.

E. Coordinate all testing of sprinkler tamper, pressure, and flow switches with the fire protection contractor.

3.4 IDENTIFICATION

A. All system devices shall be labeled in the field.

B. For each smoke detector, heat detector, flame detector, duct mounted type smoke detector, manual pull station and/or other alarm initiating device, provide the following:

1. Adhesive backed, vinyl cloth, numbered labels, identifying the device specifically by system address.
2. Labels shall be white background color with solid black numbers. Numbers shall be not less than 5/8" high x 1/8" stroke wide.
3. Design Equipment: Seton Nameplate Co.- Style M3847 or equivalent.

C. For each shut down relay and/or auxiliary control relay and for specific remote lamps, provide the following:

1. Adhesive backed, engraved lamicoid type labels specifically identifying what the fan shut down relay is shutting down, what relay is controlling or what the remote lamp is connected to.
2. Labels shall be black face with white sandwich color, nom: 1/2" tall x 2" wide, with capital letters not less than 3/16" tall engraved into the surface.
3. Design Equipment: Local fabrication by contractor.

D. Provide labels for all smoke detectors that activate elevator recall, smoke hatch operation or fireman's car operation.

E. All addressable control modules shall be labeled with address, the name of the device being controlled and the location of that device.

F. All labels shall be visible once device is installed.

G. Provide label on each power supply indicating power supply designation, 120 volt panel and associated circuit breaker number.

H. All concealed covers for all system outlet and pull boxes installed shall be factory or field painted red.

1. On the inside face of each outlet box cover, Contractor shall provide labeling, indicating; System address, Circuit Number, Horn/Speaker/Strobe Circuit Number, etc.

I. Provide identification of each circuit breaker feeding on each FACP, Notification Appliance Power Supply Panel and Notification Appliance Power Supply Extender Panel indicating that the circuit feeds the fire alarm system per NFPA 72 by marking in RED "Fire Alarm System".

3.5 CLEANING AND ADJUSTMENT

A. Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by the manufacturer.

B. Occupancy Adjustments: Within one year of the date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit the actual occupied conditions.

3.6 CENTRAL MONITORING AND PROGRAMMING REQUIREMENTS

A. Provide communication wiring from the fire alarm panel digital communicator to the telephone system utility demark. Provide all cross connects to establish two independent phone line connections. Coordinate phone lines with the owner to their selected central monitoring agency.

B. Provide documentation of all FACP messages. FACP messages must be approved by the engineer and owner's representative, prior to start of system programming. Provide custom messages and alarm coding as directed by the owners selected central monitoring agency.

C. FACP descriptors utilize room/space designations and numbers to be used by the facility after occupancy and those descriptors shall be approved by the engineer and Owner's representative. Descriptors shall be no longer than (1) full line of characters on the FACP display and shall contain the room number and room use type.

D. Contractor shall allow for two fire alarm system re-programming as directed by the Owner's representative. Contractor shall include all time and travel expenses for (2) two all day site visits for system re-programming during the warranty period.

E. Provide all required alarm and supervisory alarm output settings to the owners selected central monitoring agency.

3.7 RECORD DOCUMENTS

A. Provide complete set of as-built record drawings and documents.

B. Prior to request for final payment submit a quantity of bound Operator Manuals that shall include as a minimum:

1. All documents required by the Submittal Section of this specification updated to reflect as-built project conditions
2. Final Bill of Material.
3. Instruction report stating when instruction was given and who was in attendance, signed by the Owner's Representative. Provide written operator instructions for basic system operation, interpretation of system outputs, operation of manual evacuation signaling and ancillary controls and the use of drill functions (if applicable).
4. Detailed description of routine maintenance and testing as required and recommended for each type of device installed. Maintenance guide shall include:

    a. Listing of each individual device that requires periodic testing and maintenance.
    b. Step by step procedures for the testing and maintenance for each device listed.
    c. Schedule for the testing and maintenance as recommended by NFPA 72 for each device listed.

5. Submit a written test report from an authorized representative of the equipment manufacturer that each device and overall system operation has been 100% tested and approved. Certificate of Completion, Fire Alarm System Inspection and testing form and all other system acceptance documents as described in NFPA-72.

3.8 WARRANTY AND INSTRUCTION

A. The complete fire protection system shall be fully tested and guaranteed for a period of one year after Owner's Representative written acceptance.

B. Provide a minimum of 4 hours of instruction to the operating personnel designated by the Owner's Representative with regard to use and operation of the system. Content of the training shall include:

1. Overview of system operations.
2. Overview of system equipment and device locations.
3. Detailed operation guidelines.
4. Periodic maintenance procedures.
5. Periodic testing procedures.

C. Provide 3 sets of keys to all panels, manual stations, etc., to the Owner's Representative.

END OF SECTION 283110

SECTION 311201 - SITE PREPARATION

1.0 PART 1 - GENERAL

1.1 RELATED DOCUMENTS

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in Division 31, 32 and 33.

1.2 DESCRIPTION OF WORK

A. The extent of site preparation is shown on the drawings.

B. Site preparation work includes, but is not limited to, the following:

1. Site investigation and underground utility identification
2. Protection of existing trees, shrubs, ground covers and lawns to remain
3. Topsoil stripping and stockpiling on site (See Section 329201)
4. Site clearing and removals
5. Asphalt milling
6. Saw cutting
7. Relocations/salvaged materials
8. Clean up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 329201 – Seeded Lawns

C. Section 334001 - Storm Drainage

1.4 SITE INVESTIGATION

A. The Contractor shall visit the site before bidding, inform and familiarize themselves of all site conditions, including but not limited to, site topsoil, sub-soil, rock, subsurface and groundwater conditions affecting proposed work. No allowance or additional cost will be made in the work of this contract for failing to determine overall project site conditions.

B. Verify locations and protect utilities and structures, whether or not shown on the drawings. Existing utilities and structures shown on the drawings are for the Contractor's convenience and locations are not guaranteed.

C. Verify survey information given on drawings. Walk the site with the Owner's Facilities Management Personnel to discuss approximate locations of reputed utilities not shown on the survey, prior to performing work. Notify the Architect of any and all discrepancies prior to commencing work. Commencement of work will be construed as

complete acceptance of survey information. The Contractor shall provide and perform Ground Penetrating Radar (GPR) utility location prior to performing any excavation.

D. Locate and protect from disturbance existing survey monuments, pins, markers and benchmarks whether or not shown on drawings. When any disturbance or damage occurs, notify Architect in writing within 24 hours. Describe nature of disturbance or damage and date first occurred. Provide copies to applicable government and municipal agencies. Pay costs for restoring monument to satisfaction of said agencies, at no additional expense to the Owner.

E. Contractor shall provide Test Pits at all connection points at existing utilities and at all utility crossings to verify utility locations, size, type, invert, and elevations prior to ordering materials for construction. Notify the Architect of finding immediately. Contractor shall furnish all labor and materials to accomplish.

1.5 JOB CONDITIONS

A. The terms "Architect" and "Landscape Architect" for Divisions 31, 32 and 33 work shall mean Appel Osborne Landscape Architecture, 102 West Division St., Suite 100, Syracuse, NY 13204, Tel. (315) 476-1022 or other representative(s) that King + King Architects may determine.

B. Examine drawings and specifications for the entire project. Become familiar with the scope and sequencing of work required. Coordinate and cooperate with other Contractors and trades working in and adjacent to the project.

C. Examine work prepared prior to this contract. Commencement of work will be construed as complete acceptance of all preparatory work by others.

D. Obtain and pay for permits required by authorities. Perform the work in compliance with applicable standards, codes and requirements of governing authorities having jurisdiction.

E. Safety is the sole responsibility of the Contractor.

F. Burning on site and use of explosives are not permitted.

G. Responsibility for existing utilities:

1. Contact Dig Safely New York at least two (2) full working days, and not more than ten (10) working days, before digging begins or as required by latest state law. Locate by hand excavation and provide protection from damage to existing utilities to remain in the area. (Tel. 811)

2. Existing utilities encountered within excavated areas shall be supported, blocked and/or braced in a manner approved by the owner of the utility. Leave supports in place to the extent required by the owner of the utility.

3. Should uncharted or incorrectly charted utilities be encountered, notify the Architect immediately for directions as to procedure.

4. Do not break utility connections without providing temporary

services as acceptable to the Architect and the owner of the utility.

5. Repair and pay for damages to existing utilities as directed by utility Owner at no additional cost to the Owner.

6. Cap ends of utilities to be abandoned or removed in accordance with regulatory agencies and as directed by the Architect.

H. Provide protections and conduct operations to prevent injury and damage to persons, work of other Contractors, existing items to remain, structures, pavements, lawns, and adjacent properties.

I. Restore work damaged by this Contractor inside and outside the contract limits to the condition existing prior to the start of work, unless otherwise directed, to the satisfaction of the Architect at no additional cost to the Owner.

J. Vehicular and pedestrian traffic control:

1. Maintain vehicular and pedestrian traffic during construction activities.

2. Provide alternate routes and traffic control around closed and obstructed traffic ways as required by governing regulations or the Owner.

3. Provide temporary fencing, flagpersons, barricades, warning signs, and warning lights or other measures to protect the public and cause the least interruption of work.

K. Field Measurements: Take necessary field horizontal and vertical measurements required in order to perform the work and design intent shown on the drawings, and outlined in the specifications. Assume complete responsibility for accuracy of such measurements and dimensions.

L. Removal of spoils, dust control, debris, snow and clean up:

1. Control air pollution caused by dust and dirt; comply with governing regulations. Water to control dust when necessary and as directed by the Architect or Certified Erosion Control Specialist. Provide water sprinkling materials, equipment and labor to prevent the nuisance of dust to the surrounding areas.

2. Legally dispose of removed and demolished items, including trash and debris, off the Owner's property, at a licensed disposal facility having adequate capacity to accept the project's waste.

3. Burning of combustible materials on the site is not permitted.

4. During the contract and at intervals as directed by the Architect, clear the site of extraneous materials, rubbish, construction waste, and debris. Leave the site in a clean, safe, neat, well-draining condition.

5. Soil and Snow Removal: Sweep roads, access ways, paved areas, and parking areas where soil, mud and debris have dropped or tracked from construction and

delivery vehicles on a daily basis and as directed by the Architect or Certified Erosion Control Specialist. Remove snow and ice from roads, access ways, paved areas and parking areas utilized for site construction purposes.

6. Spoils: Remove from site and dispose when not required for fill or determined to be unsatisfactory soil material per Section 312201 - Site Earthwork.

M. Construction Review - General: Site visits will be made by the Architect to observe construction conformance to drawings and specifications. The occasional site visits by the Architect shall not be construed as supervision of construction or make them responsible for the safety programs and precautions, including but not limited to: the safe access, visit, use, work travel, or occupancy of any person. Site visits shall not make the Architect responsible for means, methods, techniques, sequences or procedures of construction selected by the Construction Manager, Contractor or his Sub-contractors.

N. Site Complexity: The existing site will be intensively developed. Because of the construction and resulting graphic complexity, it is impractical to show every detail. However, the general design intent is clearly shown and shall be applied to individual conditions not specifically shown as directed by the Architect and at no additional cost to the Owner.

O. Asbestos, Toxic and Hazardous Materials: The Division 31, 32 and 33 site work contract does not include testing for, handling or removal of hazardous materials such as, but not limited to: asbestos, fuel, oil, PCB's, or other toxic or hazardous waste materials as identified by the EPA and/or NYSDEC. If any such materials are encountered during any part of the site work, the Contractor is responsible for identifying potential hazardous material and immediately notify all governing agencies having jurisdiction as required by law. Also, within one (1) hour of discovery notify the Architect, Landscape Architect, Consultants, and Owner. The Owner shall provide testing and removal by others, under separate contract. The Contractor shall recommence work under this contract when the Owner provides written certification that remediation is complete per governing agency. The Contractor shall not be penalized for any delays caused by the hazardous testing and removal, unless such hazardous material incident was a result of Contractor's operations. The Contractor shall indemnify and hold harmless the Architect, Landscape Architect, Consultants and Owner, agents, and employees from and against all claims, damages, losses and expenses, direct and indirect or consequential damages, including but not limited to fees and charges of attorneys and court and arbitration costs, arising out of or resulting from the performance of the work by the Architect, Landscape Architect, Consultants and Owner, or claims against the Architect, Landscape Architect, Consultants and Owner arising from the work of others, related to hazardous waste.

The above indemnification provision extends to claims against the Architect, Landscape Architect, Consultants and Owner which arise out of, are related to, or are based upon, the dispersal, discharge, escape, release or saturation of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, or pollutant in or into the atmosphere, or on, onto, upon, in or into the surface or subsurface soil, water or water courses, objects, or any tangible or intangible matter, whether sudden or not.

Should the hazardous material incident be the result of the Contractor's operations, the Contractor shall be responsible for all costs associated with the discovery and remediation of such hazardous material such as, but not limited to: testing, consultant

fees, damage, loss, fees and charges of attorneys, court and arbitration costs, claims by other contractors, direct and indirect or consequential damages.

P. Salvageable Items: Remove at any time after work starts. Storage or sale on site of salvageable and removed items is not permitted. Do not remove topsoil from site without written permission from the Owner.

Q. SUBMITTALS/PROCEDURES: Submit Tests, Shop Drawings, Material Certificates (showing content/mechanical analysis) and Manufacturer's Product Data (MPD) to Architect for review a minimum of two (2) weeks prior to installation.

1. Provide a minimum of five (5) copies from material producer or laboratory, stamped as checked and approved by the Contractor before submittal to the Architect or as otherwise indicated in Division 1. (Note: Electronic submittal process may be acceptable when approved by the Owner and Architect.)

2. Refer to individual specification sections for a list of required submittals.

3. For each material certificate required, provide certification by an Architect approved independent testing laboratory which gives analysis results and states that the material complies with or is superior to the specified requirements.

1.6 SUBMITTALS: (See 1.5, above)

A. Provide photographic documentation. Photographically document existing features which, may be affected by the construction, inside and outside the contract limit line. Existing features include, but are not limited to: structures, pavements, curbs, utilities, lawns and vegetation, especially individual trees which are over six (6") inches in diameter and noted to remain on the drawings. Also, particular attention shall be paid to the construction access, stockpile and haul road areas. Distribute a copy of the photographic documentation (digital format) to the Owner and Architect prior to the start of construction.

2.0 PART 2 - PRODUCTS

2.1 PROTECTIVE DEVICES

A. Shall include, but not be limited to; plastic fence, temporary chain link fence and gates, wood planks, rubber mats, barriers, lights, barricades, coverings, traffic controls, steel plates, and other temporary protections.

B. Contractor to provide all necessary protections required by Occupational Safety and Health Administration (OSHA).

3.0 PART 3 - EXECUTION

3.1 PROTECT EXISTING VEGETATION TO REMAIN

A. Prior to commencing site preparation work, notify Architect, and meet on site to locate existing trees, lawns and vegetation which are to remain.

B. Protect and keep existing vegetation to remain free from physical damage. Keep in a healthy, vigorous growing condition for the entire construction period as follows:

1. Keep site disturbance and staging limits to a minimum. Obtain approval from Owner for material and equipment storage areas. Limit access points and routes to the project site. Coordinate site access with other trades and contractors on the work site.

2. Groups of Trees and Vegetation: Place orange plastic construction fencing around drip line(s) of trees and plant beds as detailed or directed by the Architect. Do not store materials, run equipment, park vehicles, or otherwise disturb area within the drip line (full canopy of tree) or in plant beds.

3. Specimen and Individual Trees: Protect each as noted and detailed. Do not store materials, run equipment, park vehicles or otherwise disturb area within the drip line (full canopy of tree).

C. Rejuvenate damaged vegetation by pruning watering, fertilizing, staking and other methods as directed by the Architect. Replace trees and other vegetation that cannot be restored to full growth with comparable size, quantity, quality and species as determined by the Architect.

D. Repair lawns disturbed due to construction operations outside the grading limits, as specified and directed by the Architect. Provide screened topsoil, seed, and mulch over damaged lawn areas, access ways or where tire rutting occurred.

3.2 TOPSOIL STRIPPING AND STOCKPILING ON SITE

A. Strip full depth of existing topsoil from areas to be regraded, paved, or otherwise built upon. When amount of available topsoil exceeds what is indicated in geo-tech/boring report, on site test pits, or Contractor assumed depth, continue to remove all topsoil and lower the paved or built element subgrade. Place additional satisfactory earth fill in uniform depths as indicated in the Site Earthwork Section 312201. Maintain finished grades as shown on the drawings. This work shall be done at no additional cost to the Owner.

B. Minimum quantity of topsoil shall be as needed to provide four (4") inches settled depth on lawn areas. Verify quality and quantity. Supply imported topsoil when amount of available topsoil meeting above requirements is less than what is required for the proposed lawn and/or other vegetated areas. See Section 329201 for imported topsoil requirements.

C. When amount of available topsoil meeting above requirements exceeds what is required for the proposed lawn areas, lower the lawn subgrade and place additional topsoil in a uniform depth as directed by the Architect. Maintain finish grades as shown on the drawings. This work shall be performed and supplied at no additional cost to the Owner.

D. Topsoil shall be well drained, homogeneous texture soil of uniform grade, without the admixture of subsoil material. Topsoil shall be free of dense material, hardpan, and stone over three-quarters (3/4") inch in diameter, and other objectionable foreign material including, but not limited to, brick, concrete, asphalt, glass, nails, screws, toxins,

hazardous wastes and chemicals (such as, but not limited to, atrizene and muriatic acid) that may be injurious to humans, animals and plant materials.

E. Stockpile on site where shown on the drawings or as directed by the Owner. Provide all hauling as necessary. Do not mix topsoil stockpiles with other materials. Do not remove topsoil from site without written permission by the Owner. Stabilize and maintain all stockpiles as specified.

3.3 SITE CLEARING AND REMOVALS

A. Items and materials noted to be removed shall become the property of the Contractor, unless otherwise noted. Obtain Owner's approval prior to removal off site or for relocation of salvaged material on site. Remove material off site and legally dispose of it. Backfill voids with imported granular backfill, placed in eight (8") inch layers compacted to 95% maximum density.

B. Remove physical elements above and below grade as shown and which interfere with proposed construction. Physical elements include but are not limited to: trees, root systems, shrubs, vines, grass, vegetation, pavements, walks, curbs, gutters, foundations, previous construction materials, glass, headwalls, flared end sections, catch basins, manholes, inlets, drywells, septic tanks, unused utilities, pipes, cisterns, walls, rocks, and other debris.

C. Trees, shrubs and roots shall be completely removed and disposed of legally off site.

D. Maintain existing utilities shown to remain and protect from damage during demolition and construction operations. Do not interrupt existing utilities; provide temporary services when required, as acceptable to the Architect.

E. Research with Owner possible locations of existing subsurface utilities prior to excavating.

3.4 ASPHALT MILLING

A. Mill existing asphalt to limits shown on the drawings and dispose off site.

B. The Contractor shall use equipment with automatic grade and slope controls, capable of cold milling existing asphalt pavement to an accurate depth of cut, profile and cross slope and shall be capable of loading the milled material directly into trucks.

C. Cold milling asphalt pavement shall be performed in a manner which prevents the tearing and breaking of underlying and adjacent pavement and the contamination of the millings with granular subbase material, subgrade or deleterious materials. All millings shall be loaded directly to trucks from the milling machine and hauled to stockpile or disposed of.

D. The milled surface shall be swept and jet washed clean prior to installation of new surface material. The Contractor shall sweep the surface in a manner which minimizes dust.

E. The Contractor shall promptly repair any and all localized areas of distress in the milled surface that may present a hazard to traffic, the finished surface, the stability of the new asphalt, or deemed unsuitable by the Architect, at no additional cost to the Owner.

F. Contractor shall apply NYSDOT approved tack coat to the cleaned, milled surface in preparation to received new top course asphalt as specified in Section 321201 - Asphalt Paving.

3.5 SAW CUTTING

A. The Work consists of vertical saw cutting of the existing asphalt or concrete pavement structure to facilitate the removal of the asphalt or concrete bound material.

B. The equipment shall be capable of producing a smooth vertical saw cut without causing damage to the adjacent pavements or related site features.

C. The Contractor shall saw cut the asphalt/concrete pavement to a depth which will allow removal of the material without causing damage to the adjacent pavement. Rough, jagged or cracked edges will not be acceptable. Concrete pavement shall be removed at the nearest contraction joint.

3.6 RELOCATIONS

A. Any item noted to be relocated shall be removed by the Contractor from its existing position without damaging it, stored, protected from theft, fire, vandalism and damage for the project duration. Reset in the location(s) and in the manner detailed, noted on the drawings or specified.

B. Backfill voids with imported granular fill material, placed in eight (8") inch layers compacted to 95% maximum density when located in proposed pavement areas or 90% maximum density when located in proposed non-paved areas.

C. Salvaged items shall be returned to the Owner as noted on the drawings. Move items to Owner designated areas.

3.7 CLEAN UP

During the contract and at intervals as directed by the Architect and as site preparation is completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 311201

SECTION 312201 - SITE EARTHWORK

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of site earthwork and site grading is shown on the drawings.

B. Site earthwork includes, but is not limited to, the following:

1. Fill Materials
2. Source Quality Control
3. Shoring, Bracing and Supporting
4. Horizontal and Vertical Layout
5. Grading and Excavation
6. Compacted Backfill and Fill
7. Stone Blanket(s)
8. Field Quality Control Testing and Inspection Services
9. Guarantee
10. As-Built Survey
11. Clean Up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312501 - Erosion, Sediment and Pollution Control

C. Section 334001 - Storm Drainage

1.3 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D 75 - Practice for Sampling Aggregates

D. ASTM D 422 - Particle-Size Analysis of Soils (without Hydrometer Analysis)

E. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3)

F. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

G. ASTM D 2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)

H. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

J. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

K. ASTM D 6938 - In Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods

L. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

M. ASTM D 5084 - Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

N. Deep Ripping and Decompaction shall be per NYSDEC recommendations, latest edition

O. Occupational Health and Safety Administration Regulations and Standards

P. American Sports Builders Association (ASBA): Sports Fields - A Construction and Maintenance Manual, latest edition.

Q. ASTM F2898-11 – Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-Confined Area Flood Test Method

R. EN 12616 – Permeability of Synthetic Turf Sports Field Base Stone by Double Ring Infiltrometer, Method A.

1.4 SUBMITTALS (See Section 311201, 1.5)

A. Furnish name of experienced layout foreman meeting experience requirements in 1.5 "Quality Assurance" to perform layout and obtain Architect's approval prior to performing work.

B. Submit written report on Contractor's letterhead verifying the layout foreman's involvement with the project layout. The report shall briefly state the scope of services performed for the project, the dates work was accomplished, and an explanation of any adjustments required, specifically listing as-built and FIELD VERIFY requirements as noted in 3.2 of this specification section.

C. Provide Earthwork Contractor's experience requirements as indicated in 1.5, "Quality Assurance". Obtain Architect's approval prior to performing work.

D. Samples: 10 lb. samples of each type of fill; submit in airtight containers to testing laboratory.

E. Materials Sources: Submit name of imported materials source for each type of fill material.

F. Fill Composition Test Reports (Imported and Onsite): Provide results of laboratory tests (less than 2 months old) on proposed and actual materials used to determine acceptability. This shall include:

1. One optimum moisture-maximum density curve (Modified Proctor) for each soil/imported fill type as determined by ASTM D1557, Method A, latest issue.
2. Sieve Analysis - ASTM D422
3. Moisture Density Relationship - ASTM D1557, Method C / ASTM D698
4. Plasticity Index - ASTM D4318
5. Soundness Test - ASTM C88
6. Soil Classification - AASHTO and ASTM D2487

G. Compaction Density Test Report(s) required in Field Quality Control of this specification.

H. Contractor's NYS Licensed Professional Engineer's layout and design calculations of sheet piling and shoring required.

I. Synthetic Turf Permeability Testing: Engage an independent testing agency to perform ten (10) permeability test of both the finishing stone and base stone of proposed synthetic turf stone blanket as determined by ASTM D2434, ASTM F2898-11, and EN 12616. Results shall meet the following at minimum:

1. permeability of base stone $\geq$ 40"/hour
2. permeability for finishing stone $\geq$ 40"/hour

J. Retaining Wall Permeability Testing: Engage an independent testing agency to perform one (1) permeability test of retaining wall backfill as determined by ASTM D2434 and ASTM D5084. Results shall meet permeability for retaining wall backfill > 3"/hour at a minimum.

K. As-Built Survey: The Contractor shall have NYS Licensed Land Surveyor provide an updated AutoCAD file .dwg site survey, version 2020, or newer, and stamped pdf electronic copies of fully completed proposed site work (including but not limited to: spot elevations, contours, drainage structures and pipes with inverts, utilities, asphalt, concrete, and all site elements) at ALL proposed site work, to a minimum of 15’-0” beyond the proposed site work into existing conditions.

1.5 QUALITY ASSURANCE

A. Perform all site earthwork, site grading and excavation in compliance with requirements of governing authorities having jurisdiction, OSHA Standards, and "References" in this project specification.

B. The Owner will employ a licensed soil testing and inspection service for Field Quality Control Testing of materials. This Contractor will coordinate day to day scheduling with the Owner's testing agency for conformance with "Field Quality Control Testing and Inspection Services" in this project specification.

C. Earthwork Contractor Experience Requirements: Submit business name, business Owner(s) name(s), business address, telephone number, website and/or email address signed by the Contractor/Subcontractor who meets the qualifications set forth in this specification and is proposed by the Contractor to perform the Earthwork for this Project. Provide a list of at least four (4) Earthwork projects of comparable size, scope and quality completed successfully by the proposed Contractor/Subcontractor within the past three (3) years that includes the date completed, project Owner's name and current contact information, including telephone numbers and email addresses.

D. Layout Foreman Experience: The Earthwork Contractor must provide a competent layout foreman skilled in this specific type of layout/earthwork project. The layout/earthwork foreman shall have a minimum of four (4) similar projects completed within the last three (3) years. Provide a list of projects layout/earthwork foremen has completed including project name, address, Owner contact information and project scope of work.

1.6 JOB CONDITIONS

A. Job conditions in Section 311201 apply.

B. Provide sufficient quantities of fill materials to meet project schedule and requirements. When necessary, store materials on site in advance of need.

C. When fill materials need to be stored on site, locate stockpiles where directed by Owner.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination of material types.

3. Protect all stockpiles from erosion and deterioration of materials by covering with plastic sheets, tarps or as directed by the Architect.

D. Moisten or dry, fill or backfill materials, to the proper moisture content as determined in accordance with ASTM D1557, Method C in order to obtain proper compaction as indicated.

E. The Contractor shall familiarize him/herself with results and information contained within the Geotechnical Data & Attachment Report. These onsite soils are very sensitive to moisture and vibration. The Contractor shall take note and anticipate these soils will lose strength and mitigate in the presence of water and normal construction traffic and may turn into a "quick" condition (i.e. complete loss of shear strength and turning into a liquid-like condition). Achieving satisfactory compaction on these soils will be difficult, especially during wet conditions. This condition shall be taken into account within the Contractor's bid and schedule.

1.7 SUB-SURFACE SOIL INFORMATION

A. Refer to subsurface information elsewhere in the specifications. The geo-technical data on subsurface conditions is not intended as representation warranties of the continuity of such conditions between test pits or test borings made by the Owner and included in the specification. It is expressly understood that the Owner, Architect, Landscape Architect, and Consulting Engineers are not responsible for interpretations or conclusions drawn therefrom by the Contractor. The data is made available for the convenience of the Contractor.

B. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner, provided such operations are acceptable to the Architect and Owner. Coordinate test locations with Owner prior to starting work. Backfill immediately when completed and repair to satisfactory conditions as determined by the Architect. It is expressly understood that the Owner, Architect, Landscape Architect, and Consulting Engineers are not responsible for interpretations or conclusions drawn therefrom by the Contractor.

1.8 UNUSUAL SUBSURFACE CONDITIONS

A. Notify the Architect immediately in writing via email when unusual conditions are encountered during excavation, including, but not limited to: excessive flooding, miscellaneous structures, uncharted or unlocated utilities, foundations, bed rock, toxic and hazardous materials and chemicals (such as muriatic acid and atrizene), suspected archaeological artifacts, and unsatisfactory soil materials. Request clarification from the Owner's Representative or Architect before proceeding. Refer to paragraph 3.4 of this specification.

2.0 PART 2 -PRODUCTS

2.1 FILL MATERIALS

A. **Satisfactory General Earth Fill:**

1. To be used at least 5'-0" outside of structural elements, concrete seating walls, and synthetic turf subgrade areas.

2. Satisfactory general earth fill shall be satisfactory on-site subsoil, or hauled in off-site subsoil free of toxics, hazardous wastes and chemicals (such as, but not limited to, atrizene and muriatic acid) that may be injurious to humans, animals and plant materials. Satisfactory earth fill shall also be free of rubbish, debris, wood, masonry, metal, frost, vegetation, organics or other deleterious material, which cannot be properly compacted. Use satisfactory general earth fill that is dry and free of clay. Rocks, gravel or soil shall not be larger than 3" in any dimension/direction.

3. Satisfactory earth fill materials are also defined as those complying with the American Association of State Highway Transportation Officials (AASHTO), M-145 soil classification Groups A-1, A-2-4, A-2-5, A-3 and Unified Soil Classification System GW, GP, GM, GC, SW, SP, SM, and SC (or a combination of these group symbols) as determined by ASTM D2487.

B. **Imported Granular Backfill:**

1. Imported granular backfill to be used for asphalt pavement subbase, concrete subbase, storm structures, storm pipes, water pipes, other structures, and where indicated on the drawings.

2. Backfill shall be run of crusher limestone meeting the following gradation as determined by ASTM-C136:

Standard Sieve Sizes	Percent Passing By Weight
2" or 50 mm	100%
3/4" or 19 mm	75 - 90%
1/4" or 6.3 mm	25 - 60%
#40 or 0.425 mm	5 - 40%
#200 or 0.075 mm	0 - 8%

3. Backfill shall be free of debris and deleterious materials. In no case shall the plasticity index exceed 5.0 or the percentage passing the 200 mesh sieve exceed 8%. The quality of the imported granular backfill shall be determined by the magnesium sulfate soundness test, if considered suspect by the Architect or Geotechnical Engineer. The maximum percent loss at four cycles by weight shall be 20.

C. **Imported Structural Fill:**

1. Imported structural fill to be used in areas of structural elements, for top eight (8") inches of design subgrade elevation for synthetic turf fields and where noted on the drawings.

2. Shall be run-of-bank or run-of-crusher gravel free from organic matter or other deleterious materials, meeting the material gradation requirements of Item 304.05 Sub-base Course, Type 4, of the NYSDOT's Standard Specifications for Construction Materials, as determined by ASTM C136.

Standard Sieve Sizes	Percent Passing By Weight
2" or 50 mm	100%
1/4" or 6.3 mm	25 - 60%
#40 or 0.425 mm	5 - 40%
#200 or 0.075 mm	0 - 8%

3. Imported structural fill shall be accepted on the basis of gradation, soundness, plasticity index and a well-defined Moisture-Density Relationship Curve. Imported structural fill to be placed within 8" of final exterior subgrade shall be subject to Soundness requirements. Soundness shall be less than 30% loss based on a four-cycle magnesium sulfate soundness test. Plasticity Index of that portion of fill material passing the No. 40 mesh sieve shall not exceed 5.0.

D. **Drywell and Stormwater Management Trench (SMT) Backfill:**

1. Shall be No. 1 clean, washed, crushed stone or crushed gravel meeting the following gradation as determined by ASTM C136:

Standard Sieve Size	Percent Passing By Weight
1" or 25.0 mm	100%
1/2" or 12.5 mm	90-100%
1/4" or 6.3 mm	0-15%

E. **Retaining Wall(s) Backfill:**

1. Shall be run-of-crusher hard durable limestone having a gradation by weight in accordance with ASTM C-136, within the following limits:

Standard Sieve Sizes	Percent Passing By Weight
2" or 50 mm	100%
3/4" or 19 mm	75 - 90%
1/4" or 6.3 mm	25 - 60%
#40 or 0.425 mm	5 - 40%
#200 or 0.075 mm	0 - 2%

2. Backfill shall be free of debris and deleterious materials. In no case shall the plasticity index exceed 5.0 or the percentage passing the 200 mesh sieve exceed 2%. The quality of the retaining wall backfill shall be determined by the magnesium sulfate soundness test, if considered suspect by the Architect or Geotechnical Engineer. The maximum percent loss at four cycles by weight shall be 20.

3. Material shall have a permeability of 2.4"/hour (1.7 x 10-3 cm/s) or greater when compacted to required density.

F. **Stone Blanket (For Synthetic Turf):**

1. Material shall be a 100% fractured, by mechanical means, with elongated characters on each individual particle larger than 1/4". Material shall be clean of mineral fines with particles smaller than 1/4" by manufactured means. Rounded sands and crushed gravels are prohibited.

2. Shall be crushed hard durable limestone meeting the following gradation as determined by ASTM C136:

Standard Sieve Sizes	Base Stone Percent Passing by Weight	1/2" Max. Depth Finishing Stone Percent Passing by Weight
1-1/2" or 38.0 mm	100	-

1" or 25.0 mm	95 - 100	-
3/4" or 19.0 mm	80 - 100	-
1/2" or 12.5 mm	60 - 80	100
3/8" or 9.5 mm	30 - 50	95 - 100
No. 4 or 4.75 mm	20 - 40	70 - 85
No. 8 or 2.36 mm	10 - 30	45 - 60
No. 16 or 1.18 mm	2 - 25	25 - 40
No. 40 or 0.425 mm	5 - 17	2 - 12
No. 200 or 0.075 mm	0 - 4	0 - 3

3. Delivery Moisture Content: Processed stone must contain 90% to 110% of the optimum moisture content to ensure that fines do not migrate and to facilitate proper compaction. The Contractor shall ensure aggregate leaving the source plant meets this requirement and shall be required to apply water to the processed stone on site if necessary, to achieve the minimum moisture content.

4. Stone blanket stone shall be free of debris and deleterious materials. In no case shall the plasticity index exceed 5.0 or the percentage passing the 200-mesh sieve exceed 4%. The quality of the stone blanket shall be determined by the magnesium sulfate soundness test, if considered suspect by the Architect or Geotechnical Engineer. The maximum percent loss at four cycles by weight shall be 20.

5. Soil Separation Fabric: Shall commercially manufactured non-woven polypropylene filter fabric. Standard of quality shall be Mirafi 140N as manufactured by TENCATE or Architect approved equal.

6. Mechanical analysis of base and finishing stone shall be reviewed and approved by both the Architect and Turf Manufacturer.

2.2 UNSATISFACTORY SOIL MATERIALS

A. Shall be defined as soil with high percentage of decomposed rock, sand, organic matter or moisture laden clay to prevent adequate compaction. Also, soil with toxics, hazardous wastes and chemicals (such as atrizene and muriatic acid) that may be injurious to humans, animals and plant materials. Also, soil with significant quantities of rubbish, debris, wood, masonry, metal, frost or other deleterious material which, in the opinion of the Geotechnical Engineer, Owner's Representative, and Architect, cannot be properly compacted shall be classified as unsatisfactory.

B. Unsatisfactory soil materials are defined as those described in AASHTO M-145, soil classification, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 with CBR value less than 7.0. Also Unified Soil Classification System ML, CL, OL, MH, CH, OH as determined by ASTM D2487 (or a combination of these group symbols) with CBR value less than 7.0 in addition to peat (PT) and other highly organic soils, cobbles, boulders; and soil materials, of any classifications that have a moisture content at the time of compaction beyond the range of 1% below and 3% above the optimum moisture content of the soil material/backfill material, as determined by the Moisture Density Relationship test.

C. When unsatisfactory soil materials are encountered at proposed subgrades and other design elevations, proceed as described in Part 3 (Execution) of this Section.

D. When excavated materials become unsatisfactory as a direct result of the Contractor's work, this shall result in the rejection of the unsatisfactory soil materials by the Architect.

E. The use of slag (a byproduct of metal processing) or recycled/crushed concrete is unacceptable for any use on this project site.

2.3 SOURCE QUALITY CONTROL

A. See "Submittals" and "Quality Assurance" of this specification section for general requirements for testing and analysis of soil and fill materials.

B. Where fill materials are specified by reference to a specific standard, Contractor is responsible to test and analyze all samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest until approved.

2.4 SHORING, BRACING AND SUPPORTING

A. Shoring and bracing shall conform to the requirements of the Occupational Health and Safety Act.

B. Shoring and bracing shall be provided, placed and maintained at the locations and elevation that are necessary or required to: support and protect the sides and bottom of the excavation; prevent undue disturbance or weakening of the supporting materials below or beside the works; prevent movement of ground which may disturb or damage the work, adjacent pavements, property, structures or other works.

C. Provide materials for shoring, bracing, and supporting, such as sheet piling, uprights, sheathing, stringers, and cross-braces, in good serviceable condition. Use timbers that are sound and free of large or loose knots.

D. Provide design by Contractor's NYS Licensed Engineer, when shoring is required to perform work as shown on the drawings. Submit to Architect for approval.

E. Installation: Shoring and bracing shall be driven and placed so that it can be removed as backfilling takes place without damage to the pipeline or its appurtenances, structures, and without settlement of or damage to adjacent pavements and structures.

F. Removal: The Contractor shall remove all shoring and bracing as the excavation is backfilled, unless directed by the Architect to be left in place. The procedure for extracting shoring and bracing and placing backfill shall ensure the backfill load is applied gradually, and disturbance of the works or foundation material is avoided.

G. Support all utilities as required by the municipality/utility owner.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field conditions such as bench marks, monuments, topography, inverts, locations of utilities and property lines before proceeding. Notify the Architect immediately, in writing, of discrepancies prior to commencing work. Commencement of work will be construed as complete acceptance of survey and layout information. Additional costs resulting from failure to verify field conditions prior to commencing work shall be borne by this Contractor and at no additional cost to the Owner.

3.2 LAYOUT

A. Stake layout up to and including those elevations and dimensions specifically noted on drawings as "FIELD VERIFY" (FV). Ensure that the field elevation and dimension agrees with the elevation and dimension on the drawings before continuing. Notify the Architect immediately, in writing, of any discrepancies prior to commencing work. Additional costs resulting from failure to verify dimensions as noted on drawings shall be borne by this Contractor and at no additional cost to the Owner.

1. Assume sole responsibility for the accuracy of the layout work.

2. Run from point(s) of beginning (POB), base lines, property monuments, benchmarks, iron survey pins, or other points given on the drawings.

3. Roads, Parking Areas, and Walks: Accurately locate and stake curb lines, center line, swales, point of curve and tangency as necessary to accurately build.

4. Buildings and Site Features: Accurately locate and stake corners, offset corners, slopes, and center lines as necessary to accurately build.

5. Pipe Work: Accurately locate with laser.

B. Athletic Field Layout:

1. Provide accurate layout, alignment and dimensions for fields as shown on drawings and detailed by professional NYS Land Surveyor [***or Layout Foreman***] approved by the Architect.

2. Accurately locate and stake field corners, subsurface location monuments and backstops. Use Owner approved corner markers or stakes 2" x 2" x 2' long pressure treated wood with 16d common nail set flush in top of stake as metal detection element. Set top of athletic field location stakes flush with adjacent finish grades. Spray paint top of stake with day glow orange paint. Protect during construction. Replace if removed at no additional cost to the Owner. Remove as directed by the Architect.

3. Temporarily stripe lawn athletic fields with field line marking mixture approved by Owner and correct surface high and low spots as described in Section 329201 prior to seeding or sodding.

4. Temporarily stripe synthetic turf stone blanket subgrade with field line marking mixture approved by Architect. Meet tolerances described in 3.3 of this specification Section. Correct differences as directed by the Architect.

5. Temporarily stripe synthetic turf stone blanket surface every five (5) yards across the field with field line marking mixture approved by Architect. Correct surface high and low spots as described in Section 334001 prior to synthetic turf installation.

3.3 GRADING

A. Cut and Fill: Presume the earthwork does **NOT** balance on site. Meet the grades shown on the drawings. Haul in or haul away as may be necessary. Provide earthwork calculations and provide for imported or exported material as part of bid. No additional costs will be allowed.

B. Grade areas as indicated, including transition areas, with uniform levels and slopes between finish elevations.

C. Cut to grades and profiles indicated.

D. Set grade stakes at fifty-foot (50') intervals, at corners, and breaks in grade.

E. Conduct operations to avoid ponding of water. Provide all pumping equipment, sump pits, and temporary diversion swales where and when necessary to continue work performance on schedule and as specified.

F. Shape subgrade surface of site elements to within 0.10' above or below required subgrade elevation, compacted as required and sloped to provide drainage as shown on the drawings. Notify Architect and Geo-Technical Engineer for subgrade review prior to continuing work.

G. Shape subgrade surface of athletic fields and track/tennis courts areas using laser plane control system for grading of subgrade elevation to ensure accuracy in grade tolerances of +0" to - ¼" in 10' any direction. Compact as required and sloped to provide drainage as shown on the drawings. Notify Architect and Geo-Technical Engineer for review prior to continuing work.

H. Refer to Section 311201 for topsoil requirements.

3.4 EXCAVATION

A. Remove and legally dispose of material encountered to obtain required subgrade elevations, including pavement, obstructions visible on ground surface, underground structures and utilities indicated to be removed.

B. Sloping and Benching: Follow OSHA recommendations based on soil type to determine slope configurations. Slope the sides of excavations five (5') feet deep and over to the angle of repose of the material excavated; otherwise, shore, and brace where sloping is not possible either because of space restrictions or stability of material excavated.

C. Bracing and Shoring:

1. Provide bracing and shoring as required in excavations, to maintain sides and to protect structures from settlement.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open. Carry down shoring and bracing as the excavation progresses.

3. Remove shoring and bracing before completion of backfilling except where required for structural support or slope stability.

4. The design, installation, and maintenance of such shoring and bracing required to accomplish the above purpose are the sole responsibility of the Contractor.

5. Follow OSHA recommendations for bracing and shoring.

6. Indemnify the Owner, the Landscape Architect, Architect, and the Consulting Engineers against any action arising from damage to existing structures, utilities or injury to persons resulting from the Contractor's actions or failure to act, in carrying out the intent of this section.

D. Protections: Protect structures, vegetation, utilities, sidewalks, pavements, and other facilities in areas of work. Barricade and secure open excavations and provide warning lights/signage from dusk to dawn each day.

E. Extent of Excavations: Excavate for structures to elevations and dimensions shown, extending excavation a sufficient distance to permit placing and removal of other work and for review. Trim bottom to required lines and grades to provide solid base to receive concrete or imported granular backfill material.

F. Unsatisfactory Soil Materials: When unsatisfactory soil materials, as defined in this specification, are encountered at design elevations, immediately notify the Architect in writing by email or other equally expeditious means. Continue as directed by the Architect and Geo-Technical Engineer. When, in the sole opinion of the Architect, conditions are not a result of Contractor's negligence, additional excavation may be directed by the Architect and paid for as a Change Order on a unit price or negotiated price basis in accordance with Contract Documents. This additional excavation shall be measured each day and verified by the Owner's representative and the Contractor's Superintendent. A daily written accounting, attested by both parties, shall be maintained with copies daily to the Architect. No claim for extra compensation will be considered except through the procedure outlined above. Assume **2,000 c.y.** of undercutting and removals, placement of soil stabilization fabric (SSF) and providing and compacting to 95% density imported granular backfill material in Base Bid. Unit price provided shall be utilized to add to or delete from this assumed quantity to account for actual quantity encountered.

G. Unauthorized and Over Excavation: Consists of removal of materials beyond required subgrade elevations or dimensions without specific direction of the Architect or Geotechnical Engineer. Unauthorized or over excavation, as well as remedial work directed by the Architect or Geotechnical Engineer, shall be at Contractor's expense. Fill of unauthorized excavations shall be as follows (all at no additional cost to the Owner):

1. Fill the voids created by the removal of materials beyond indicated subgrade elevations with lean concrete (2000 psi). Or;

2. Extending the indicated bottom elevation of the concrete footing to the lower elevation. Or;

3. Adding imported granular backfill material compacted to 95% density to proper design elevation and layout as directed by the Architect. Testing agency to perform compaction testing prior to proceeding.

H. Dewatering:

1. Contractor shall anticipate seasonal variations of soil moisture content and groundwater in the Base Bid as verified by site investigation indicated in Section 311201.

2. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

   a. Surface and ground water shall be intercepted and removed before entering excavations. All necessary measures shall be taken. Earth dikes, ditches, or other devices, if required, shall be constructed to prevent such flows.

3. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

   a. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   b. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
   c. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

4. The Contractor shall at all times provide and maintain proper and satisfactory means and devices (i.e. ditches, temporary pipes, pumps, and/or other temporary construction) for the removal of all water entering the excavations. Water shall be removed as fast as it may collect, in such manner that shall not interfere with the execution of the work or in the proper placing of pipe, structures or other work.

5. Provide and operate sufficient pumping machinery to keep excavated parts free of water. Dig sump pits when necessary into which the excavation shall be drained. Take care and proper precautions in the use of pumps so that in no case will foundations, footings and utilities already in place or existing foundations, footings of adjacent structures or utilities be undermined or disturbed, and erosion occur due to pumping.

6. Do not discharge pumped materials into any body of water, wetland, adjacent property, roadside swales, subsurface storm systems, or any infiltration practices

as determined by the Architect. Provide temporary sediment basins, traps, and filter bags for pumped water.

7. Adjust, repair, replace, or clean all work, surfaces, and property, which may have been affected as a result of any dewatering operation.

I. Prepare subgrade and twelve (12") inches of existing sub-soils below subgrade elevations in excavated areas to minimum density of 95% in structure, pavement, utility areas, trenches, and 90% under lawn non-paved areas.

J. Rock and Rock Excavation:

1. Rock Definition: Shall be defined as solid hard material located in ledges, bedded aggregate deposits and unstratified masses, and all-natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock, which must be removed by pneumatic hammers. Rock does not include shale, slate, soft sandstone, hardpan, masonry or concrete rubble, boulders less than three (3) cubic yards, such other rock material which is decomposed, stratified, weathered or shattered, or any material capable of being removed by a well maintained Caterpillar 225 power shovel, D8 Dozer with Ripper, or Architect approved equivalent.

2. Rock Excavation Administrative Procedures: When encountered, shall be stockpiled for measurement before removal and paid for on a unit price basis in accordance with Contract Documents. Notify Architect immediately of rock discovery prior to performing any rock removal or continued excavation. Rock excavations as defined shall be measured each day and verified by the Owner's designated representative and the Contractor's on-site Superintendent. A daily written accounting, attested to by both parties, shall be maintained with copies daily to the Architect. No claim for extra compensation will be considered except through the procedure outlined above. Contractor to assume **100 c.y.** of rock excavation and removal in Base Bid. Unit price provided shall be utilized to add to or deduct from this assumed quantity to account for actual quantity encountered.

3. Rock Excavation Removal Procedures: Includes removal and disposal of rock. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions.

   a. 24 inches outside of concrete forms other than at footings.
   b. 12 inches outside of concrete forms at footings.
   c. 6 inches outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 8 inches beneath bottom of concrete slabs-on-grade.
   f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

4. Any over excavation due to rock excavation and removal shall be handled as directed under "Over Excavation" in this Section.

5. Contractor has the option to remove existing rock and dispose off-site or crush existing rock and use as satisfactory general earth fill when it meets gradation noted in 312201 for imported granular backfill material.

3.5 BACKFILL AND FILL

A. Preparation of Ground Surface to Receive Fill: Remove vegetation, organic materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Break up and remove existing foundations, concrete slabs, abandoned utilities, and site features. Plow, strip, roughen, or break up slopes steeper than 1 vertical to 4 horizontal so that fill material will bond to existing surface.

B. Execute these steps when the existing ground surface, after removal of the above unsatisfactory soil materials, has a density less than that specified under "Compaction" for the particular area classification: Break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to the required depth and percentage of maximum density.

C In no case shall fill be placed on a subgrade that is wet, muddy, rutted, spongy, frozen or that contains frost or that has not been tested and approved to achieve satisfactory results.

D. Areas to receive any fill or backfill should be properly prepared, proof rolled, tested per "Field Quality Control" within this specification, inspected and approved by the Architect and Geo-Technical Engineer prior to the placement of fill.

E. Following grade approval by the Architect and Geo-Technical Engineer, place imported granular backfill, imported structural fill and satisfactory general earth fill material in layers not more than eight (8") inches in loose depth in a manner to minimize segregation. The fill shall be placed in nearly horizontal lifts commencing at the lowest fill area elevation and proceeding with each lift upward and outward from the lower lift.

F. Moisture Content: Contractor shall anticipate seasonal variations of all soils (on site or imported) and imported fills moisture content in the Base Bid and timing required for such shall be included in the project schedule. The moisture content of the materials shall be adjusted prior to application of compaction such that it is no more than 1% below or 3% above the optimum moisture content of the material. Apply water to surface, subgrade or layers of soil material when required to achieve compaction densities stated below. Remove and replace, or scarify and air dry, soils or imported materials that is too wet to permit compaction to specified density.

G. Compaction:

1. Compact each eight (8") inch layer of fill and backfill materials.

2. Compact fill and backfill material below subgrade for structures, slabs, pavements, and utilities to minimum 95% of optimum in place density as determined by ASTM D1557, Modified Proctor.

3. Compact fill material below subgrade for lawns or unpaved areas to minimum 90% of optimum in place density as determined by ASTM D1557, Modified Proctor.

H. Equipment:

1. Use sheepsfoot rollers, pneumatic tired rollers, drum rollers, vibrating tampers, and other compaction equipment capable of obtaining the required density throughout the entire layer being compacted.

2. Use power-driven hand tampers for compacting materials adjacent to site structures.

3. For utility trenches or other confined areas, small compaction equipment may be necessary such as a vibratory plate, jumping jack or walk-behind vibratory roller. In these cases, lift heights no greater than six (6") inches should be maintained.

I. Reconditioning Compacted Areas: Where previously completed compacted areas are disturbed by subsequent construction operations (by any Contractor), traffic or adverse weather, scarify and dry out the surface, regrade, and recompact to the required density prior to further construction at no additional cost to the Owner. Use hand tamping for recompaction over underground utilities and trenches.

3.6 STONE BLANKET (FOR SYNTHETIC TURF)

A. Prepare subgrade under the stone blanket to a smooth, firm, well draining surface, sloped as detailed. At no time shall the subgrade be rutted by construction traffic including during the stone blanket material installation. Engage with Owner's testing agency to proof roll the turf subgrade and mark "soft spots" for additional compaction. Repair or replace areas that do not pass proof rolling test as directed by the testing agency.

B. Install geotextile fabric, overlapping rolls a minimum of 24" at all seams. Install and secure flat drains into perimeter storm pipe with approved couplers as shown on the drawings. Secure all coupler connections with waterproof PVC tape.

C. Handling and Placement:

1. Prior to stone blanket material placement, remove any excess or contaminated backfill from the storm pipes, flat drains, and/or geotextile fabric as directed by the Architect.

2. Should any separation of the materials occur during any stage of the spreading or stockpiling, the Contractor must immediately remove and dispose of segregated material and correct or change handling procedures to prevent any further separation.

3. Utilize a laser plane control system for the grading of the processed stone to ensure accuracy in the grade tolerances of +0" to -1/4" in 10'-0" (measured in any direction).

4. Install processed stone base, from sideline toward center-line, parallel to the flat drain network, to the lines and grades shown on the drawings. Under no circumstances shall the material be pushed more than 30' from the point of discharge. Each layer must be spread uniformly with equipment that will not cause perceptible separation in gradation (segregation of the aggregates), preferably a self-propelled paving machine or laser controlled low ground pressure (LPG) dozer.

5. Shape the final surface of the processed stone to receive the turf system component and continue until the deviation from the required elevation does not exceed a maximum deviation from grade of +0" to -1/4" in ten feet (10'), when measured in any direction using a 10' straight-edge.

6. Engage Owner's testing agency to proof roll wherever possible and mark "soft spots" for additional compaction. Use static tandem drum-type roller of not less than five (5) tons weight. Repair or replace areas that do not pass proof rolling test as directed by the testing agency.

7. The stone blanket base stone shall be compacted and unyielding, as directed and approved by the Architect.

8. Install finishing stone and roll tight to achieve a unyielding condition so that the surface shall not deviate more than 1/4" in 10' (measured in any direction) when placed under a 10' foot straight edge. This tolerance is required over the entire field.

9. On the completed stone blanket, install temporary painted lines fifteen (15') feet on center approximately on the 5 yard line and review for proper planarity. Perform "string grading" check along these 5 yard lines in the presence of the Architect and Turf Installer. Adjust high and low areas with similar stone blanket material as directed by the Architect and Turf Installer prior to placement of the turf.

10. The surface of the stone blanket course shall be well drained at all times. The permeability of the aggregate shall be checked per ASTM 2434 (constant head) testing methods. Test samples shall be as described in this specification section.

11. Once the stone blanket is in place, the testing agency shall perform permeability tests on the stone blanket in locations as directed by the Architect per EN 12616 and ASTM F2898-11. Provide water necessary for tests.

12. All test results will be logged and documented by the Contractor's Onsite Layout Foreman and Geotechnical Engineer for the testing agency. If at any time the stone blanket base does not meet project specifications, it shall be the Contractor's responsibility to restore, at his expense, the stone blanket base to the required grade, cross section, permeability, infiltration, and density.

13. After the Contractor has independently confirmed compliance with all the above tolerances (planarity and elevation verified by a licensed surveyor and compaction, gradation, permeability, and infiltration verified by geotechnical engineer), he shall notify the Architect and schedule a final site observation for

approval. The Contractor shall make available an orbital laser system and other equipment to the Owner's Inspection Team for the inspection process.

14. Once the stone blanket is approved by the Owner, Architect, Geotechnical Engineer and Turf Installer, install the synthetic turf over the stone blanket as shown on the drawings, approved submittals and as specified. Prior to start of synthetic turf installation, the Turf Manufacturer/Turf Installer of the synthetic turf system shall inspect the stone blanket and supply a letter certifying base acceptance for the purposes of obtaining the Manufacturer's warranty for the synthetic turf playing surface.

15. The Site Contractor is responsible for providing daily onsite supervision of Turf Installer subcontractor at all times to ensure stone blanket planarity, drainage, and compaction is maintained during and after the turf installation.

3.7 FIELD QUALITY CONTROL TESTING AND INSPECTION SERVICES

A. Soil Testing Service/Geo-Technical Engineer must inspect and approve density tests, retesting, and proof rolling of subgrades, as described in this section, before further construction work is performed thereon.

B. Perform compaction density testing on compacted fill and imported granular base course in accordance with ASTM D1556, ASTM D1557, ASTM D2922, and D3017.

C. In place density testing should be performed at a frequency of one (1) test per 500 square feet per lift in smaller open areas, one (1) test per 2,500 square feet per lift in larger open areas, and one (1) test per 25 feet per lift in confined areas and utility trenches.

D. When the test results indicate that insufficient compaction has been obtained in any layer, the Contractor shall take action to modify or alter the moisture content in the soil, to provide additional compaction and testing or otherwise to increase the in-place soil density. If the Contractor cannot obtain satisfactory compaction due to material properties, the Contractor shall remove the unsatisfactory material and replace with new material at no additional cost to the Owner.

E. Materials contaminated by mud, debris, organics, frost, and/or other deleterious materials shall be removed and replaced with uncontaminated specified material.

F. No fill or backfill shall be placed over an area or lift of fill that has not be tested and achieved satisfactory results.

G. Proof Rolling: On pavement subgrades, in cut areas only, unless otherwise directed by the Architect, the only testing required will be the proof rolling as described below:

1. Provide Soil Testing Service/Geo-Technical Engineer with 48-hour advance notification when subgrades are ready to proof roll.

2. Proof Roll the prepared pavement subgrade surface with fully loaded ten (10 c.y.) cubic yard earth moving truck or, in the opinion of the Architect/Geo-Technical Engineer, using a 5-ton smooth drum roller making at least 3 overlapping passes, in each of 2 perpendicular directions, on static mode at a speed of 1 to 4

feet/second. Check for unstable areas. Subgrades that rut, pump or deflect under the truck's tires may be judged unstable by the Architect/Geo-Technical Engineer. These areas may require further compaction or undercutting as directed by the Soil Testing Service/Geo-Technical Engineer.

H. Stone Blanket Field Testing:

1. Subgrade: Proof rolling and density testing for subgrade as described in Section 312201.

2. Stone Blanket (for Synthetic Turf Field):

a. Proof rolling as described.

b. Permeability Test: Perform two (2) permeability test of both installed finishing and base stone as determined by ASTM D2434 confirming permeability rate outlined in "SUBMITTALS" of this specification section.

c. Infiltrometer Tests: Engage the independent testing agency to perform permeability testing of the in-place stone blanket per EN 12616 and ASTM F2898-11. Results shall meet the following: Direct infiltration rate of stone blanket system ≥ 40"/hour.

i. Notify Architect forty-eight (48 hrs.) hours in advance and provide water, materials, machinery and labor to carry out testing in presence of Architect.
ii. Perform ten (10) permeability tests each on the installed synthetic turf stone blanket in areas as directed by the Architect.
iii. Repair all test areas to match surrounding stone blanket material.

3.8 GUARANTEE

A. Guarantee concrete slabs, pavements, curbs, seating walls, stairs, trenches, utilities, structures, synthetic turf, and lawns free from settlement for a period of one (1) year from the date given on the certificate of substantial completion or final punch list when satisfactorily completed and accepted by the Architect, whichever is later.

B. Repair to proper grade and alignment any and all settlement of concrete slabs, pavements, curbs, seating walls, stairs, trenches, utilities, structures, synthetic turf, and lawns adversely affected by settlement within one (1) year after date given on the certificate of substantial completion or final punch list when satisfactorily completed and accepted by the Architect, whichever is later, at no additional expense to the Owner. In damaged compacted areas, scarify the surface, re-shape, and compact to required density prior to further construction.

C. All repairs/corrections shall be completed to the satisfaction of the Owner within seven (7) days of written notice by the Owner.

3.9. AS-BUILT SURVEY

A. Provide full as-built survey in AutoCAD .dwg format with stamped .pdf electronic files to the Architect for approvals. Survey shall include: spot elevations, contours, drainage pipes and structures with installed inverts, utilities, and all site pavements and elements)

B. Survey shall be conducted by a NYS Licensed Surveyor.

C. Areas to be surveyed include ALL completed proposed site work to a minimum of 15’-0” beyond the proposed site work into existing conditions

3.10 CLEAN UP

During the contract and at intervals as directed by the Architect and as earthwork is completed, clear the site of surplus earth, large surface stones, debris, tools and equipment. Leave the site in a clean, safe, well draining, and neat condition.

END OF SECTION 312201

SECTION 312320 – BUILDING EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary General Conditions and Division 01 Specification Sections, apply to work of this section.

1.2 SUMMARY

A. Furnish all labor, materials and complete all work of this Section as shown on the drawings and/or as specified herein, including but not limited to the following:

1. Excavation of soils for foundations.
2. Placement of compacted fill and materials.
3. Installation of geotextile fabrics.
4. Installation of drainage materials around or under foundation structures.
5. Installation of all sheeting, shoring and bracing required to execute the work.
6. Disposal of all excavated material off site, unless satisfactory for site earthwork fill.

B. Related Sections:

1. Division 01 Section “Special Inspection and Testing.”
2. Division 01 Section “Unit Prices.”
3. Division 01 Section “Allowances.”
4. Division 03 Section “Cast-in-Place Concrete.”
5. Division 31, 32 and 33 sections related to building earthwork.
6. Applicable utility specification sections for excavation and backfilling for underslab utilities within building.

1.3 DEFINITIONS

A. Structure: Buildings, foundations, slabs, tanks, curbs, or other manmade stationary features.

B. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase.

C. Borrow: On or Off-site material used as a fill material. Any borrow material must meet the requirements for the specific fill material for which it is to be used.

D. Fill Material: Material used to bring a subgrade elevation up to the required elevation.

E. Structural Fill: Fill material placed in a controlled manner to be used below subbase material and to backfill foundation excavations.

F. Subbase: A layer of well-compacting run-of-crusher stone material used below slabs and pavements.

G. Drainage Fill: Well-draining crushed stone material used to facilitate drainage around or under a foundation structure.

H. #2 Crushed Stone: Well-draining material to be placed below a foundation to create a working surface.

I. Controlled Low-Strength Material (Flowable Fill): Controlled-density flowable cementitious backfill material.

1.4 SUBMITTALS

A. Test Reports: Prior to delivery or use of fill material, submit the following reports of each material:

1. Description and source of material.
2. Gradation analysis of fill material performed within one year prior to start of project.
3. For compactable fill materials, Modified Proctor laboratory compaction test ASTM D 1557
4. Geotechnical testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct required laboratory geotechnical testing without delaying the progress of the work.

B. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled Low-Strength Material (Flowable Fill), including design mixture.

C. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextiles: 12 inches by 12 inches.

D. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Special Inspections: See Section 014533 – “Special Inspection and Testing” for a description of the special inspection and testing to be paid for by the Owner, and for the extent of the Contractor’s responsibilities with regard to the Special Inspection and Testing program.

C. Reference Standards: The following standards shall be applicable.

1. 2020 Uniform Code of New York State
2. "Standard Specifications, Construction and Materials”, New York State Department of Transportation (NYSDOT).
3. "Guidelines for Erosion and Sediment Control in Urban Areas of New York State", New York State Department of Environmental Conservation (NYSDEC).

1.6 PROJECT CONDITIONS

A. Site Information: Data in subsurface investigation reports was used for the basis of the design and may be available to the Contractor, but for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.

1. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option. No change in the Contract Sum will be authorized for such additional exploration.

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.
2. Prevent interruption of existing utilities serving facilities occupied by Owner or others, during occupied hours, except when interruption is permitted in writing by Architect and then only after providing acceptable temporary utility services. Provide minimum of 48-hour notice to Owner and receive written notice to proceed before interrupting any utility.
3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

C. Use of Explosives: Use of explosives is not permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified elsewhere are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

C. Structural Fill: Naturally- or artificially-graded mixture of sand, natural or crushed stone or gravel conforming to NYS DOT Standard Specification Section 304, Subbase Course Type 4, with gradation:

U.S. Sieve No.	Percent Passing by Weight
2 inch	100
1/4 inch	30-65
No. 40	5-40
No. 200	0-10

D. Subbase: Naturally- or artificially-graded crushed stone conforming to NYS DOT Standard Specification Section 304, Subbase Course Type 2, with gradation:

U.S. Sieve No.	Percent Passing by Weight
2 inch	100
1/4 inch	25 - 60
No. 40	5 - 40
No. 200	0 - 10

E. Drainage Fill: Clean, durable, angular crushed stone coarse aggregate conforming to NYSDOT Standard Specification Section 703-02, Size #1.

U.S. Sieve No.	Percent Passing by Weight
1 inch	100
1/2 inch	90-100
1/4 inch	0-15

F. #2 Crushed Stone: Clean, durable, angular crushed stone coarse aggregate conforming to NYSDOT Standard Specification Section 703-02, Size #2.

U.S. Sieve No.	Percent Passing by Weight
1½ inch	100
1 inch	90-100
1/2 inch	0-15

2.2 GEOTEXTILES

A. Separation / Filter Fabric: Nonwoven needle-punched geotextile, manufactured for soil separation and subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.
2. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
3. Permittivity: 1.7 per second, minimum; ASTM D 4491
4. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.

B. Stabilization Fabric: Woven geotextile fabric, manufactured for soil separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.

2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.05 per second, minimum; ASTM D 4491.
4. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type I or Type II.
2. Fly Ash (optional): ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33
4. Foaming Agent (optional): ASTM C 869.
5. Water: ASTM C 94.
6. Air-Entraining Admixture (optional): ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with 28-day compressive strength between 50 and 100 psi, when tested according to ASTM D 4832.

2.4 DRAINAGE PIPING AND FITTINGS

A. High Density Polyethylene (HDPE) Piping: Double-wall pipe with smooth interior and corrugated exterior conforming to AASHTO M252. Pipe size and type as indicated on Drawings.

1. Perforated Drain Pipe: AASHTO M252 Type SP.
2. Solid Pipe: AASHTO M252 Type S.
3. Joints: Silt-tight joints with an elastomeric rubber seal conforming to AASHTO M252.

PART 3 - EXECUTION

3.1 PROTECTION

A. Provide planking at walks, pavements and curbs to be crossed by equipment and erect barricades at open excavations.

B. Protect and maintain utility services and adjacent pavement and property. Inform the Owner and utility company immediately of any damage. Correct damage at the expense of the Contractor.

C. Maintain open and unobstructed traffic on adjacent vehicular and pedestrian ways, except as provided by written approval of Owner.

D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

E. Protect and maintain erosion and sedimentation controls during earth-moving operations.

F. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.2 LAYOUT, LINES AND LEVELS

A. Establish base lines. Mark well and protect during construction.

B. Check existing elevations. Notify Architect if different than shown on drawings.

C. Locate corner, offset corners and grade stakes where spot elevations are shown, at breaks in grade, and as otherwise required to complete the work as shown.

D. Accurately locate building. Advise Architect of any discrepancies discovered, prior to commencing work.

3.3 DEWATERING

A. Means and methods of dewatering are responsibility of Contractor.

B. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

C. Maintain excavations without accumulation of water. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sump pits, suction and discharge lines and any other dewatering system components as needed to convey water away from excavations.

1. Place sump pits outside of building footprint.

D. Convey water removed from excavations and rain water to collecting or run off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

3.4 EXCAVATION

A. Excavation consists of removal and disposal of material encountered when establishing finish grade elevations.

B. Excavate to elevations and dimensions indicated; allow additional space as required for construction operations and inspecting of foundations.

C. Unauthorized excavation, at Contractor’s expense, consists of removal of materials beyond indicated subgrade elevations.

1. Under footings, backfill unauthorized excavation by extending indicated bottom elevation of footing or bases to excavation bottom, without altering required top elevation. Flowable Fill, #2 Crushed Stone or Subbase Material may be used to bring elevations to proper position. Flowable Fill, if used, shall extend at least 12 inches horizontally beyond the foundation limits for its entire depth. #2 Crushed Stone or Subbase Material, if used, shall extend beyond the foundation limits a horizontal distance of at least one-half the thickness of the fill material beneath the foundation.
2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification.

D. Additional Excavation: See paragraph 3.5.

E. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

F. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces in good serviceable condition. Maintain shoring and bracing in excavations regardless of time excavations will be open. Carry down shoring and bracing as excavation progresses. Bracing will not be permitted against pipes or structures in trenches.

G. Excavation for Structures: Conform to elevations and dimensions shown of the drawings, within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

1. In excavating for footings and foundations, prevent disturbance of bottom of the excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave a solid base to receive concrete.
2. Unless noted otherwise, where footings abut existing footings, match bottom of existing footing elevation.

H. Excavation for Trenches: Dig trenches to the uniform width required for item to be installed, sufficiently wide to provide ample working room. Provide required clearance on both sides of pipe or conduit.

1. Trenches for drainage piping indicated on structural drawings and specified herein:

    a. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
    b. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
    c. Backfill trenches only after satisfactory tests and inspections have been made. Use care in backfilling to avoid damage or displacement of pipe systems.

2. Trenches for underground utilities indicated on plumbing and/or electrical drawings and specified by plumbing or electrical engineer:

    a. Excavate trenches to depth indicated on plumbing and/or electrical drawings. Carry depth of trenches for piping to establish indicated flow lines and invert elevations indicated on plumbing drawings. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
    b. Grade bottoms of trenches as indicated on plumbing and/or electrical drawings, notching under pipe bells to provide solid bearing for entire body of pipe.
    c. See plumbing and/or electrical drawings for pipe bedding, haunching, and backfill materials and compaction requirements.
    d. Backfill trenches with concrete where trench excavations pass within 18 inches and below of column or wall footings. Place concrete to level of bottom of adjacent footing.

e. Backfill trenches only after satisfactory tests and inspections have been made. Use care in backfilling to avoid damage or displacement of pipe systems.

3.5 REVIEW OF SUBGRADE

A. Notify Special Inspector when excavations have reached required subgrade.

B. Under supervision of Geotechnical Engineering Special Inspection Agent (GESIA), proofroll subgrade below building slabs and pavements with a min. 5-ton roller, making two overlapping passes in two perpendicular directions.

C. When GESIA determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted Structural Fill as directed.

1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the GESIA.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for fill materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.7 GEOTEXTILE FABRICS

A. Place geotextile fabrics where indicated on Drawings.

B. Fabrics may be joined by either sewing or overlapping. Sewn seams shall be lapped a minimum of 4 inches and double sewn with nylon or polypropylene. Overlapped seams shall have a minimum overlap of 18 inches.

C. Fabric which is torn or damaged shall be replaced or patched. The patch shall extend 3 feet beyond the perimeter of the tear or damage.

D. Traffic or construction equipment shall not be permitted directly on the fabric. Maintain a minimum of 8 inches loose thickness of fill material above fabric subject to traffic.

3.8 DRAINAGE PIPING

A. General: Install drainage piping in accordance with ASTM D 2321 “Practice for Installing Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.”

B. General Locations and Arrangements: Drawings indicate the general location and arrangement of drainage piping. Location and arrangement of piping layout take into account many design considerations. Install piping as indicated to the extent practical.

C. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream.

D. Install piping at constant slope between points and elevations indicated. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated to achieve positive drainage.

E. Join and install pipe and fittings in accordance with manufacturer's installation recommendations.

F. Bedding and backfilling of piping as indicated on Drawings.

3.9 COMPACTION

A. General: Control soil compaction during construction, providing minimum percentage of density specified for each classification.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D 1557.

1. Subbases: Compact each layer of subbase material to 95 percent maximum dry density.
2. Structural Fill: Compact to 95 percent maximum dry density within building and below all slabs and pavements and to 90 percent maximum dry density outside the building in landscaped areas.

C. Moisture Control: Where subgrade or layer of fill material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.10 FILL

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

B. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below (elevations shown on drawings are compacted depths):

1. Adjacent to foundations and other excavations, use Structural Fill.
2. Under slabs-on-grade, use Structural Fill to within six inches of bottom of slabs. Use Subbase between Structural Fill and bottom of slabs.
3. Refer to Section 033000 and contract drawings regarding installation of Vapor Barrier.

C. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including perimeter insulation.
2. Inspection, testing, approval and recording locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removal of trash and debris.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

D. Placement and Compaction: Place Structural Fill in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

1. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Place backfill or fill material only on surfaces that are not muddy, frozen or contain frost or ice.
2. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

E. Bring the finished subgrade around the building to elevations indicated, and sloped to drain water away from the building walls. Fill to required elevations areas where settlement occurs.

F. During compacting, adequately support all walls, etc., against overturning, bowing, or other harm caused by compaction procedures, pressures. Before placing fill, remove all debris subject to termite attack, rot or corrosion, and all deleterious materials from areas to be backfilled.

G. When sheeting, shoring, bracing is removed, fill voids with material as specified.

3.11 GRADING

A. Grading Surface of Subbase Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½-inch when tested with a 10-foot straight edge.

B. Compaction: After grading, compact material to the depth and percentage of maximum density for each area classification.

3.12 QUALITY CONTROL

A. Special Inspections: See Section 014533 – “Special Inspection and Testing” for a description of the special inspection and testing to be paid for by the Owner and for the extent of the Contractor’s responsibilities with regard to the Special Inspection and Testing program.

3.13 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction, and as indicated.

3.14 MAINTENANCE

A. Protection of Graded Areas:

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
2. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

3.15 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove excavated material, trash, debris and waste material and dispose of it off Owner's property in a legal manner. Entire area shall be left in a neat and sightly condition.

END OF SECTION 312320

SECTION 312501 - EROSION, SEDIMENT AND POLLUTION CONTROL

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide erosion, sediment and pollution controls as shown on the drawings and as directed by the Architect to significantly reduce runoff on downstream and neighboring properties. This includes temporary control measures to mitigate land disruption by other Contractors during construction of this project.

B. Erosion, sediment and pollution control includes, but is not limited to, the following:

1. Storm structure protection
2. Silt fence
3. Off site sediment tracking controls
4. Triangular silt dikes
5. Temporary concrete washout facility
6. Temporary seeding and mulching
7. Permanent seeding
8. Straw mat
9. Temporary sediment filter bag for pumped water
10. Construction site dust control
11. Spill prevention, reporting and documentation
12. Clean up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

D. Code Compliance: The New York State Department of Environmental Conservation requires a SPDES General Permit for Storm Water Discharges from Construction Activity. This Permit GP-0-25-001 is pursuant to the Environmental Conservation Law and has penalties and fines related to violations.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312201 - Site Earthwork

C. Section 329201 – Seeded Lawns

D. Section 334001 - Storm Drainage

1.3 REFERENCES

A. Spill Guidelines Manual (SGM) New York State Dept. of Environmental Conservation.

B. New York State Standards and Specifications for Erosion and Sediment Control, dated July 2016 or latest edition.

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Manufacturer's Data (MPD) are required for:

1. Storm Structure Protection
2. Silt Fence with Net Backing
3. Soil Stabilization Fabric for Off Site Sediment Tracking Control
4. Triangle Silt Dikes
5. Sediment Filter Bag
6. Straw Mat
7. Spill Response Equipment

B. Material Certificates (MC) showing content/mechanical analysis and Samples are required for:

1. No. 3 Stone for Off Site Sediment Tracking Control
2. Temporary Seeding and Mulching: Submit seed mix species and mulch source
3. Permanent Seeding: (See Section 329201)

C. Certification Statement: Submit photocopy of Section 312501, 1.7, filled out completely and accurately to the Landscape Architect at the pre-construction meeting.

D. Listing of emergency contract numbers. This list shall include the name of an Emergency Response Contractor that may be used in certain situations.

E. Per NYSDEC SPDES Regulations, all onsite contractors performing earth disturbing activities need to have current NYSDEC endorsed 4-hour erosion and sediment (E&SC) training. Provide copies of all onsite personnel certification cards, prior to construction. The document shall be kept on file (by the Contractor) within the onsite SWPPP log book.

1.5 QUALITY ASSURANCE

A. Perform erosion, sediment and pollution control in compliance with applicable requirements of the New York Standards and Specifications Erosion and Sediment Control Manual, dated July 2016 (or latest edition) or other governing authorities having jurisdiction.

B. Prevention of erosion and pollution from storm water runoff for the duration of this project is the responsibility of this Contractor. All Storm Water Pollution Prevention control work indicated on the drawings and/or specifications shall be included in this Contractor's Base Bid. Damages resulting from, but not limited to, negligence, improper maintenance or general disregard for erosion control measures shall be immediately corrected by this Contractor to the satisfaction of the Landscape Architect, Engineer, or Certified Erosion Control Specialist hired by the Owner for SWPPP inspections as required by NYSDEC. Damages resulting from other contractors shall be repaired by this Contractor on a time and materials basis and back charged to the responsible party. Any fines levied on the Owner by governing authorities for SWPPP violations shall be back charged to the responsible party.

C. In the event of a chemical or hazardous spill or release, the individual(s) who caused the spill is responsible for prompt and proper clean-up. If the spill requires cleanup procedures beyond the means of the Contractor, an emergency spill cleanup Subcontractor shall be hired by the Contractor. They shall be utilized when the Contractor does not have the appropriate training, equipment or materials to cleanup the area safely and effectively. This shall be done at no additional cost to the Owner. Any testing and cleanup required post cleanup shall be provided by the Contractor at no additional cost to the Owner.

1.6 JOB CONDITIONS

A. Job conditions in Sections 311201, 312201, 329201 and 334001 apply.

B. Contractor will take all necessary precautions to avoid allowing dust generation that violates NYSDEC regulations and compromises compliance with governing authorities air monitoring plan.

C. Winter Stabilization Requirement: When construction schedule, regardless of reason, prohibits installation of permanent stabilization measures and site elements, including substantial lawn growth to prevent erosion, this Contractor shall install and provide temporary seeding, mulching, and other preventative/stabilization measures specified and as directed by the Landscape Architect at no additional cost to the Owner.

1.7 CERTIFICATIONS

A. Authorized, legally responsible signatures for the General Contractor, Site Contractor, Site Earthwork, Landscaping Subcontractor(s) and any other soil disturbing Contractor shall sign and prominently display the following certification statement at the job trailer or office during the life of the project:

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the Storm Water Pollution Prevention Plan (SWPPP) and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for storm water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

1. General Contractor Signature: _____

Name: _____

Title: _____

Address: _____

_____

Phone No.: _____

Email: _____

2. Site Earthwork Contr.

Signature: _____

Name: _____

Title: _____

Address: _____

_____

Phone No.: _____

Email: _____

3. Site Landscaping Contr.

Signature: _____

Name: _____

Title: _____

Address: _____

_____

Phone No.: _____

Email: _____

4. Other Sub Contractors as determined by the Architect

Signature: _____

Name: _____

Title: _____

Address: _____

_____

Phone No.: _____

Email: _____

1.8 NOTICES

A. The Operator (Owner) shall file with the New York State Department of Environmental Conservation (NYSDEC) a Notice of Intent (NOI) a minimum of ten (10) days prior to start of construction. Unless notified by the NYSDEC to the contrary within ten (10) days, a general SPDES permit is automatically issued which authorizes discharge of storm water on the construction site.

B. When the site has been finally stabilized, the Operator (Owner) shall file with the NYSDEC a Notice of Termination (NOT).

C. The Operator (Owner) is responsible for payment of annual fees related to the SPDES permit. Filing of a NOT shall typically terminate the Operator's fee responsibility.

1.9 INSPECTIONS AND MAINTENANCE

A. The Architect or qualified personnel of the Operator shall inspect disturbed areas of the construction site at least once per week. Special attention will be focused on areas not finally stabilized, structural control measures, point discharge (outlets) and locations where vehicles enter or exit the site. Disturbed areas will be inspected for pollutants entering the drainage system. Structural control measures will be reviewed for effectiveness in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site will be inspected for evidence of off site sediment tracking. A written report of inspections shall be produced in a journal during the construction operations. The journal shall be made available (by the Operator/Owner) for NYSDEC and the general public to review.

B. The Contractor shall provide timely maintenance of vegetation erosion and sediment control measures, and other protective measures, during construction. Corrective measures must be performed within one (1) calendar day of the Architect's or Operator's (Owner's) report. Failure by the Contractor to perform corrective work within this schedule automatically authorizes the Operator to hire others and backcharge this Contractor. The Architect or Operator will send a letter or email correspondence one (1) calendar day before hiring others and backcharging this Contractor. The Contractor shall keep a written record of maintenance and corrective work in a journal. The journal shall be made available for the Operator, Architect, Landscape Architect, Soil and Water Conservation District, ACOE, and NYSDEC until the site is finally stabilized.

C. The Contractor shall conduct daily inspections of the equipment staging and maintenance, fueling, hazardous waste staging and waste storage areas to ensure that spill control measures are in place. Stock appropriate clean-up materials whenever changes occur in the types of chemicals used or stored on site.

D. The Contractor is responsible for having mandatory, up to date NYSDEC endorsed 4-hour erosion and sediment control (E&SC) training all personnel working on site in accordance with the SPDES permit.

E. The Operator (Owner) shall provide long term maintenance of the storm water facilities after the site is finally stabilized. The designated maintenance personnel shall keep written records and pictures of maintenance and corrective work in a journal. All stormwater discharge points shall be maintained, inspected, and documented. The

journal shall be made available for review by the NYSDEC for a minimum period of five (5) years after the Notice of Termination (NOT) has been filed.

1.10 SPILL PREVENTION, REPORTING AND DOCUMENTATION

A. To minimize the potential for discharge to the environment of oils, petroleum, or other hazardous substances, the following requirements shall apply:

1. All oil, petroleum, or hazardous materials stored or temporarily relocated on site during the construction process shall be stored in a way to provide protection from vehicular damage and to provide containment of leaks or spills. Temporary berms, dikes, storage basins, or similar methods shall be employed as appropriate on site.

2. Refer to Storm Water Pollution Prevention Plan Notes for additional spill prevention good housekeeping practices.

3. Maintain file of Material Safety Data Sheets (MSDSs) or other references for recommended spill clean-up methods and materials.

4. Keep spill response equipment readily accessible.

B. In the event of a spill contact the Construction Manager, Owner (Operator), and Architect. The Contractor shall also notify all other Contractors working around the area of the spill.

C. If spilled material has entered any sanitary/storm sewer system then contact the municipality or agency with jurisdiction over the system, in addition to those listed in this section.

D. The contractor shall be responsible for the initiation of spill reporting and documentation procedures. All petroleum spills must be reported to NYSDEC Spill Hotline at 1-800-457-7362, less than two (2) hours following discovery. All petroleum spills must be reported to NYSDEC unless all of the following apply:

Criteria	Description
Quantity	Must be known to be less than 5 gallons.
Containment	Must be contained on an impervious surface or within an impervious structure. No access to the environment.
Control	Must be under control and not reach a drain or leave the impervious surface.
Cleanup	Must be cleaned-up within two (2) hours of occurrence.
Environment	Must not have already entered into soil or groundwater or onto surface water.

E. A release of a "reportable quantity"[1] or unknown amount of a hazardous substance must also be immediately reported to the NYSDEC Spill Hotline. Spills of reportable quantities of chemicals or "harmful quantities"[2] of oil to navigable waters must be reported to the federal National Response Center, 1-800-424-8802 or 1-202-426-2675.

[1] *Reportable Quantity*: Refers to the quantity of a hazardous substance or oil that triggers reporting requirements under the Comprehensive Emergency Response, Compensation, and Liability Act (CERCLA) (USEPA, September 1992).

[2] *Harmful Quantity*: Includes discharges that violate applicable water quality standards, cause a film, sheen, or discoloration on a water surface or adjoining shoreline; or cause a sludge or emulsion to be deposited beneath the water surface or shoreline (40 CFR 110.3).

2.0 PART 2 - PRODUCTS

2.1 STORM STRUCTURE PROTECTION

A. Shall be a pre-manufactured cylindrical log 12" – 32" in diameter, composed of degradable geotextile mush tube filled with compost filter media to filter sediment and other pollutants. Filter socks may be filled after placement by blowing compost into the tube pneumatically or filled at a staging location and moved into its designated location. Both ends of the filter socks shall be secured to prevent opening.

B. The flat dimension of the sock shall be at least 1.5 times the nominal diameter of the sock.

C. Compost infill shall be a well decomposed (matured at least 3 months), weed-free, organic matter. Shall be aerobically composted, possess no objectionable odors, and contain less than 1% by dry weight, or manmade foreign matter.

D. All biosolids compost must meet NYS DEC's 6NYCRR Part 360 (Solid Waste Management Facilities) requirements.

E. When using compost filter socks adjacent to surface water, the compost should have a low nutrient value.

F. Wood stakes shall be a minimum of 2" x 2" in size. Shall be untreated fir, redwood, cedar or pine and shall be cut from sound timbers. Shall be straight and free of loose and unsound knots or other defects which would render them as unfit for the intended use. Metal stakes may not be used as an alternate. Tops of stakes shall not extend above the top of the fiber roll.

G. Standard of quality shall be: Diamond SOCK® pre-filled compost filter sock as manufactured by MKB Stormwater Innovation, 888-578-0777; or Architect Approved Equal

2.2 SILT FENCE

A. Shall be a woven polypropylene geotextile comprised of UV stabilized polypropylene slit film and 1.25" square, non pressure treated, pointed, hardwood posts and net mesh backing for additional support. Standard of quality for silt fence shall be IVI-3611MW as manufactured by Indian Valley Industries, Inc., www.iviindustries.com, (607) 729-5111, or Architect approved equal.

2.3 OFF SITE SEDIMENT TRACKING CONTROLS

A. No. 3 stone shall meet the following requirements:

Standard ASTM Sieve Size	Percent Passing by Weight
3"	100
2"	0-15
Passing No. 50	5-10
Passing No. 100	2-5

B. Soil Stabilization Fabric: Shall be a commercially manufactured, UV stabilized low clogging, high flow, woven geotextile. Standard of quality shall be Mirafi 600X, as manufactured by NICOLON/MIRAFI GROUP, 3500 Parkway Lane, Norcross, Georgia (Tel. 1-800-234-0484) or Architect approved equal.

C. Granular Base Course Material (for Type 2 only): Shall be as specified in Section 312201.

2.4 TRIANGULAR SILT DIKES

A. Silt dikes shall be triangular-shaped, having a height of at least eight to ten inches (8" - 10") in the center with equal side and a sixteen to twenty inch (16" - 20") base. The triangular-shaped inner material shall be urethane foam. The outer cover shall be woven geotextile fabric placed around the inner material and allowed to extend beyond both sides of the triangle two to three (2' - 3') feet. Standard length of each dike will be seven feet (7') unless otherwise indicated on the plans. The dikes shall be attached to the ground with wire staples.

B. Wire staples shall be No. 11 gauge wire and be at least six to eight (6" - 8") inches long. Staples shall be placed as indicated on the installation detail.

C. Standard of Quality shall be Triangular Silt Dike as manufactured by Triangular Silt Dike, Inc., 608 Greenwood Drive, Midwest City, OK 73110, (800) 290-8473.

2.5 TEMPORARY SEDIMENT FILTER BAG FOR PUMPED WATER

A. Provide prefabricated bags/pouches with nonwoven geotextile fabric. The standard of quality shall be Dirtbag as manufactured by ACF Environmental, 800-448-3636 or Architect approved equal.

B. Provide wooden pallet to set filter bag on for ease of disposal.

2.6 TEMPORARY CONCRETE WASHOUT FACILITY

A. Concrete washout facility to fully contain all concrete washout needs of the entire project and all contracts.

B. Concrete washout facility shall be temporary straw bales that are lined with a single sheet of a minimum of 10 mil polyethylene sheeting that extends over the entire basin to prevent escape of discharge. Place a secure, non-collapsing, non-water collecting cover over the concrete washout facility prior to inclement weather to prevent accumulation and overflow of precipitation.

C. Provide concrete washout to prevent discharge from concrete trucks or equipment cleaning to inlets, surface or groundwater.

D. Concrete washout facility shall be no closer than 50 feet from environmentally sensitive areas such as waterbodies, wetlands, and open drainage facilities and watercourses. Signs shall designate concrete washout facilities.

E. Ensure that the concrete washout facility complies with all Federal, State and local laws, rules, and regulations. Ensure that the concrete washout facility is in place before delivery of concrete to site.

F. Provide a sign identifying area as "Concrete Washout" acceptable to the Architect. Maintain throughout the project duration.

2.7 TEMPORARY SEEDING AND MULCHING

A. Seeding shall be 100% Perennial Ryegrass with no more than 30% of any one cultivar and always at least 2 different cultivars and a 90% germination rate or more.

B. All seed mixtures to contain 0.5% weed seed or less.

C. All seed must be fresh seed, not seed that is left over from last year and beyond the sell by date.

D. Dry mulch shall be clean straw bales.

2.8 PERMANENT SEEDING

Seeding shall be as specified in Section 329201.

2.9 STRAW MAT

A. 100% biodegradable thread on 1.5 inch centers stitched to a 100% biodegradable natural fiber top net. Blanket shall be manufactured with a colored line or thread stitched 2-5 inches from edge to ensure proper overlap. Standard width is 4'-0".

B. Standard of quality shall be BioNet Blanket as manufactured by North American Green, 1-800-772-2040 or Architect approved equal for the following slope conditions:

Slope Condition	Water Flow Condition	Product Type
4:1 (or flatter)	Low flow (5 fps)	S75BN: Single Net Straw
3:1	Moderate flow (6 fps)	S150BN: Double Net Straw
2:1	Medium flow (8 fps)	SC150BN: Double Net Straw-Coconut (70/30 blend)
1:1 (and greater)	High Flow (10 fps)	C125BN: Double Net Coconut

C. Stakes: Six inch lengths of 100% biodegradable "T" shaped pin designed to safely secure erosion control blanket. Standard of quality shall be Bio-Stake as manufactured by North American Green or Architect approved equal.

2.10 SPILL RESPONSE EQUIPMENT

A. The following is a list of recommended spill control material. The contractor is responsible to have spill control and personnel protective equipment readily available for the materials being used. Acquire sufficient quantities and types of appropriate spill control materials needed to contain any spills that can be reasonably anticipated. The need for equipment to disperse, collect and contain spill control materials should be on site at all times.

1. Personal Protective Equipment
   a. Chemical Splash Goggles
   b. Gloves
   c. Boot Covers
   d. Tyvek Aprons or Suits

2. Absorption Materials
   a. Spill Pillows and Socks
   b. Absorbent Booms and Pads
   c. Dikes for use on rough surfaces
   d. Storm Structure Covers
   e. “Loose” Absorbents

3. Tools
   a. Shovel, Broom, Brush
   b. Disposal Bags
   c. Sealing Tape
   d. Hazardous Waste Stickers
   e. “Danger” and “Keep Away” Signs
   f. Five gallon pails or 20 gallon drums with polyethylene liners

B. Basis of Design shall be provided by: 3M, 888-364-3577; New Pig Corporation, 800-468-4647; SpillKits911, 800-474-5911; Dawg, Inc., 800-935-3294; or Architect approved equal.

C. Place spill response equipment in a readily assessable location within or immediately adjacent to the project site.

3.0 PART 3 - EXECUTION

3.1 SIGNATURE REQUIREMENTS

A. Between the Pre-Construction Meeting and starting site work, the Contractor shall:

1. Sign the certification statements. Contractor shall prominently display the statements at the job site.

2. Review inspection and maintenance procedures. Decide where journals will be temporarily stored for review by NYSDEC, S&WC, ACOE, Operator (Owner), the Landscape Architect and Architect.

3. Designate specific Owner and Contractor personnel responsible for daily inspection and maintenance. Provide certification cards.

3.2 GENERAL EROSION CONTROL

A. Install initial construction erosion control features, as indicated on drawings and specifications or as directed by the Architect, prior to topsoil stripping, earthwork, and removal of existing vegetation. Keep the disturbance to a minimum and shall not exceed five (5) acres, unless directed by the Architect. Install other features as described in the sequence of erosion, sediment and pollution control on the drawings.

B. Start permanent seeding and mulching within seven (7) calendar days of rough grading. When this is not possible for any reason, provide temporary seeding on non-roof, non-paved areas with 100% perennial rye grass at the rate of six pounds (6#) seed per one thousand (1,000 sf) square feet and straw mulching for complete coverage. When adverse weather conditions prevent good germination, repeat seeding and mulching as directed by the Architect until the area is stabilized. Till under temporary grass and fine grade when preparing for final permanent lawn stabilization.

C. Until a disturbed area is stabilized, trap runoff sediment by the use of sediment debris basins, diversion swales, sediment traps, or other methods acceptable to the Architect and governing authorities. Provide temporary dry mulch (straw) to stabilize exposed soils as directed by the Architect.

D. Provide erosion controls on slopes and swales traversing, bordering, or leaving the site. Limit the water flow to a nonerosive velocity.

E. Do not store fill materials within one hundred (100') feet of the banks of any streams or waterbodies, intermittent or perennial.

F. Inspect erosion and sediment control measures immediately after each rainfall and at least daily during prolonged rainfall. Make required repairs immediately.

G. Remove sediment deposits when they reach approximately one-half of the height of the barrier. Dispose sediment in a manner that does not result in additional erosion or pollution.

H. Provide prompt (weekly) removal and disposal of rubbish and debris in accordance with the governing authorities, Owner policies, and good housekeeping measures.

I. Traffic shall not be permitted to cross filter socks.

3.3 MUNICIPAL SEWER, SWALES AND WETLAND EROSION CONTROL

Control erosion, siltation and pollution to municipal sewers, swales and wetlands by taking appropriate measures such as, but not limited to, the following:

A. Do not disturb the bed and banks of waterbodies unless specifically shown on drawings. When bed and bank work is shown, obtain permits and proceed with work creating the minimum disturbance necessary to complete the project.

B. Prevent petroleum products and excessive amounts of silt, clay, and muck from entering municipal sewers, waters, swales or wetlands of New York State during construction.

C. Prevent fresh concrete, concrete leachate, and washings from equipment and trucks, from entering municipal sewers, waters, swales or wetlands of New York State during construction.

D. Place silt fence to control erosion at the downslope edge of disturbed areas. This barrier to sediments is to be put in place before disturbance of the ground occurs and is to be maintained in good condition until disturbed land is heavily vegetated or otherwise permanently stabilized.

E. Seed areas of soil disturbance resulting from this project with appropriate perennial grass seed and mulched with straw within seven (7) calendar days as described in general erosion control. Mulch shall be maintained until a suitable vegetative ground cover is established and as directed by the Architect.

3.4 CONSTRUCTION SITE DUST CONTROL

A. The Contractor shall prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety issues.

B. Dust control applies to construction roads, access points, other disturbed areas and stockpiles subject to surface dust movement and dust blowing.

C. Contractor may use any number and combination of dust control methods, as approved by the Architect. They include:

1. Applying water to haul roads
2. Restricting vehicle speeds to 10 mph
3. Hauling materials in properly tarpped or watertight containers.
4. Covering stockpiles and materials
5. Wetting equipment and work area
6. Mulching
7. Spray adhesives and polymer additives (MSDS sheets required)
8. Barriers and wind breaks

D. Contractor is responsible for any cleanup and site restoration associated with dust control measures, dust pollution on or off the project site property at no additional cost to the Owner.

3.5 STORM STRUCTURE PROTECTION

A. Install fiber rolls as detailed around drainage structures and where shown on the plans to protect site elements from silt and sediment.

B. Filter socks shall be anchored in earth with wooden stakes driven a minimum of 12” into the soil on 4-foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of a fillet of filter media on the disturbed area side of the compost sock.

C. Wrapping the storm structure grate with fabric is NOT acceptable, however straw bales may be used.

D. Upon stabilization of the area contributary to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed in accordance with the SWPPP. For removal, the mesh can be cut, and the compost spread as an additional mulch to act as a soil supplement.

3.6 SILT FENCE

A. Locate as shown on drawings and as directed by the Architect. Excavate trench along the lower perimeter(s) of site, along the contract limit line, and as indicated on the drawings. Place excavated material on uphill side of trench for backfilling.

B. Drive stakes securely into the downhill side of the trench. When prefabricated silt fence with fabric attached to stakes is used, drive stakes so that fabric is buried in the ground as detailed.

C. Backfill trench with excavated material, so that fabric is securely buried in the ground to prevent undermining. Tamp soil.

D. Join sections by overlapping fabric between two (2) stakes. Set stakes simultaneously. Overlap by minimum six (6") inches, fold, and staple to prevent sediment bypass.

E. Attach silt fence securely to stakes spaced no more than eight (8' o.c.) feet on center. Secure fence fabric to stake with minimum three one (1") inch staples.

F. Toward the end of the project, when site is stabilized and as directed by the Architect, remove silt fence and correct lawn area around removal to a smooth, neat, well-draining condition.

3.7 OFFSITE SEDIMENT TRACKING CONTROLS

A. Install as detailed and shown on drawings to eliminate tracking sediment off site. Inspect after each rain storm and at the end of each work day.

B. When sediment begins tracking off site, sweep and clean affected roadway immediately and replace stone with clean No. 3 stone to retain sediment on site.

C. Remove fabric and stone at project completion. Complete construction of proposed final surface(s).

3.8 TRIANGULAR SILT DIKES

Install as detailed and as recommended by the manufacturer.

3.9 TEMPORARY SEDIMENT FILTER BAG FOR PUMPED WATER

A. Install prefabricated bags/pouches on top of straw bale base as recommended by the manufacturer. Replace system when full (discharge into bag/pouch is significantly reduced).

B. Silt may be used as general site fill or hauled off site. Remove straw bales, fabric, and prefabricated bags/pouches off site. Regrade area and return to lawn as specified.

3.10 TEMPORARY CONCRETE WASHOUT FACILITY

A. Install per detail in a location as approved by the Owner. Provide a stable surface, easily accessible by concrete trucks.

B. A sign shall be installed adjacent to each washout facility to inform concrete equipment operations to utilize the proper facilities. The sign shall be installed as detailed and maintained throughout the project.

C. Temporary concrete washout facility shall be constructed and maintained in sufficient quantity and size to contain all liquids and concrete waste generated by washout operations for the entire project and by all Contracts.

D. Perform washout of concrete mixers, delivery trucks, and other delivery systems in designated areas only.

E. Wash concrete only from mixer chutes into approved concrete washout facility.

F. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.

G. Contents of the concrete washout facility shall not exceed 50% capacity of the facility. At or before 50% capacity is reached, discontinue pouring concrete until the facility is cleaned out. Remove hardened concrete and properly dispose off site. Allow slurry to evaporate or remove from site and dispose off site. Immediately replace the liner if it gets damaged.

H. Remove concrete washout facility when it is no longer needed as directed by the Architect.

3.11 TEMPORARY SEEDING AND MULCHING

A. Provide temporary seeding of topsoil stockpile immediately.

B. When necessary and as directed by the Architect, provide temporary seeding and mulching on disturbed areas at no additional cost to the Owner.

3.12 PERMANENT SEEDING

A. Install as described in Section 329201.

3.13 STRAW MAT

A. Install as recommended by the manufacturer and as directed by the Architect for drainage channels and slopes.

B. Stake spacing shall reflect slope to which the straw is being applied.

3.14 SPILL RESPONSE EQUIPMENT

Use per manufacturer's recommendations and as directed by the NYSDEC, or other governing agencies.

3.15 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as erosion, sediment and pollution control procedures are completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well draining, and neat condition.

B. Clean storm ponding areas, catch basins and detention basins: Clean out contaminants, sediment, rubbish, construction debris, foreign objects and accumulated floatables from chambers and ponding areas thoroughly, immediately prior to final acceptance.

END OF SECTION 312501

SECTION 321201 - ASPHALT PAVING

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of asphalt paving is shown on the drawings.

B. Asphalt Paving work includes, but is not limited to, the following:

1. Soil Stabilization Fabric
2. Granular Base Course
3. Asphaltic Concrete
4. Bituminous Tack Coat
5. Painted Lines and Traffic Markings
6. Self-Adhering Waterproof Membrane
7. Hot Pour Crack Sealing and Filling
8. Field Quality Control
9. Clean up

C. Provide all materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312201 - Site Earthwork

C. Section 334001 - Storm Drainage

1.3 REFERENCES

A. The latest editions of the following Standards, as referenced herein, shall be applicable:

1. New York State Department of Transportation Standard Specifications, Section 402 - “Hot Mix Asphalt (HMA) Pavements" and 407 - "Bituminous Tack Coat"
2. “Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).”

B. The following reference standards shall apply for Testing and Inspection:

1. ASTM D1074: Standard Test Method for Compressive Strength of Bituminous Mixtures
2. ASTM D1188: Standard Test Method for Bulk Specific Gravity and Density of Compacted Mixtures Using Paraffin-Coated Specimens.
3. ASTM D2041: Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
4. ASTM D2726: Standard Test Method for Bulk Specific Gravity and Density of Non-absorptive Compacted Bituminous Mixtures

5. ASTM D2950: Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
6. ASTM D3203: Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
7. ASTM D3549: Standard Test Methods for Thickness or Height of Compacted Bituminous Paving Mixture Specimens
8. NYSDOT Materials Method 28 Friction Aggregate Control and Test Procedures

C. The following reference standards shall apply for pavement markings:

1. ASTM D562, D711, D1475, D1640, D2369, D3723, D3960.
2. DOT Code of Federal Regulations, Hazardous Materials and Regulations Board, Reference 49CFR, ICC Regulations
3. Federal Specification TT-P-115E, Type III (Type I if V.O.C. compliance)

D. Additional testing required, only if directed in writing by Architect, due to asphalt installation and material issues:

1. ASTM C295: Standard Guide for Petrographic Examination of Aggregate
2. ASTM D1560: Standard Test Methods for Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus
3. ASTM D4125: Standard Test Methods for Asphalt Content of Bituminous Mixtures by the Nuclear Method
4. ASTM D5444: Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
5. ASTM D6307: Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method
6. ASTM D6931: Standard Test Method for Indirect Tensile (IDT) Strength of Asphalt Mixtures
7. ASTM D7312: Standard Test Method for Determining the Pavement Shear Strain and Complex Shear Modulus of Asphalt Mixtures Using the Superpave Shear Tester

1.4 SUBMITTALS

A. Provide Paving Contractor experience requirements, as outlined in "Quality Assurance" of this specification section.

B. Provide Asphalt Producer Vendor Certificate and proof of quality control monitoring as outlined in "Quality Assurance" of this specification section.

C. Provide material certificates showing content/mechanical analysis for the following:

1. Asphaltic Concrete Mix Design with Authorization Signature:

a. Type/name of mix (less than 24 months old)
b. All aggregates gradations and quality measurements
c. Plot (0.45 power graph) of the final aggregate blend
d. Bulk (dry) specific gravity of all aggregates and final aggregate blend (Gsb) including worksheets for natural (virgin) as well as reclaimed asphalt pavement (RAP)

e. Grade of asphalt binder (PG) being used
f. Optimum percent asphalt binder (Pb)
g. Mix air voids at optimum (Va)
h. Bulk specific gravity of mix at optimum (Gmb)
i. Theoretical maximum specific gravity of mix at optimum
j. Voids in the Mineral Aggregate (VMA) and Void Filled with Asphalt (VFA)
k. Dust to total asphalt content (AC) ratio
l. All design data and associated design curves

2. Bituminous Tack Coat

D. Provide Manufacturer's Product Data (MPD) for the following:

1. Soil Stabilization Fabric
2. Painted Lines and Traffic Markings
3. Self-Adhering Waterproof Membrane
4. Hot Pour Crack Sealing and Filling

E. Provide shop drawings for the following:

1. Painted Lines and Traffic Markings: Shop drawings indicating sizes, shapes, patterns, and colors of markings, including manufacturers and types of paint.
2. Owner to approve all paint colors prior to installation.

F. Submit Asphalt Placement Work Plan, indicating paving pass widths, paving directions, site access, and timing/coordination of any site equipment installation (posts, boxes, fencing, etc.) indicated in 3.3 of this specification section. Supply Owner with yield calculations for all asphalt paving products and materials used on the project as part of the work plan.

G. Field Quality Control test reports as indicated in this specification section.

1.5 QUALITY ASSURANCE

A. Paving Contractor Experience Requirements:

1. General Paving: Contractor shall have the experience of at least five (5) years in business. Paving superintendent has a minimum of three (3) years' experience as a paving crew operating foreman.

B. Asphalt Testing and Inspection Services:

1. The Owner will employ and pay for the services of an Independent Testing Agency to provide testing and inspections of asphalt pavements.

2. The services and the information provided by the Testing Agency are provided for the sole benefit of the Owner. The information is provided to the Contractor for the sole purpose of being aware of what is being reported.

3. The Contractor is solely responsible for assuring the work complies with the Contract Documents in all respects and may not rely on the testing agency for this or any other assurances. The Testing Agency and their representatives are not authorized to revoke, alter, relax, enlarge, or release any of the requirements of the Contract Documents, approve or accept any portion of the work, perform or excuse any duties of the Contractor, or be involved in the scheduling of any work.

4. Asphalt paving materials and operations shall be tested and inspected as the work progresses. Failure by the Testing Agency to detect any defective work or material shall not in any way prevent later rejection (when such defect is discovered) nor shall it obligate the Owner for final acceptance.

C. Asphalt producer shall monitor production according to the procedures of NYSDOT Material Method 28 Friction Aggregate Control and Test Procedures. Asphalt producer shall be a New York State approved/certified HMA (Hot Mix Asphalt) manufacturing facility.

D. Calibrated equipment and qualified personnel must be always accessible during the construction of the HMA.

1.6 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Atmospheric conditions for applying courses:

1. Hot mix asphalt shall generally arrive on the project site between 270°-300° F. (per asphalt producer recommendations).

2. Place asphalt concrete wearing course or bituminous surface treatment only when atmospheric temperature is above 50 degrees F. and rising, and when asphalt binder course is thoroughly dry.

3. Place binder course only when air temperature is above 45 degrees F. and rising and when asphalt base course or granular stone base course is thoroughly dry.

C. Grade Control: Establish and maintain required lines and elevations.

D. Codes and Standards: Perform the work in compliance with applicable requirements of governing authorities having jurisdiction. Obtain and pay for permits required by local authorities.

E. Construction Review and Testing: Notify and coordinate with the Independent Testing Agency and Architect when the subgrade is shaped and ready for proof rolling. Also, when the granular base course is fully installed, compacted and ready for density testing. Protect subgrade and subbase at all times.

F. When staging or scheduling delays occur and wearing course cannot be installed directly after binder course installation before winter, provide temporary asphalt transition ramp/collar around drainage structures in paved areas and at handicap ramps to prevent

damage by snow plow. Remove prior to installation of wearing course. Power wash surface and apply asphalt tack coat, as specified, prior to wearing course installation, at no additional cost to the Owner.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver all materials to the job site with all labels intact and legible at time of installation.

B. Store materials off ground under cover. Protect from damage or deterioration.

C. Handle materials to prevent damage to surface, edges, ends and factory applied finishes of items. Damaged material shall be rejected and replaced.

2.0 PART 2 - PRODUCTS

2.1 SOIL STABILIZATION FABRIC

A. Shall be a heavy duty, commercially manufactured woven polypropylene geotextile. Standard of quality shall be Mirafi 500X, manufactured by TenCate or Architect approved equal.

2.2 GRANULAR BASE COURSE AND GRAVEL PAVEMENT

A. Shall be as specified in Section 312201.

B. The graded and designed granular base below all new Asphaltic Concrete Pavements shall be constructed, tested, and prepared in accordance with Section 312201 - Site Earthwork of the Contract Documents.

2.3 ASPHALTIC CONCRETE

A.

Pavement Types	Percent Asphalt*
19.0mm Type 3 Binder Course	4.8% Asphalt
9.5mm Type 7 Top Course	6.3% Asphalt

* Percentage of Asphalt is approximate and shall be based off actual project submittals provided by the Asphalt Producer.

B. Hot Mix Asphalt Top Course: Pavement shall meet the minimum requirements for 9.5 mm (Type 7) SUPERPAVE Hot Mix Asphalt Top Course (75 gyrations), with a PG 64-22 Binder as specified in Section 402, of the current NYSDOT Standard Specifications, with the exception that the maximum proportion of Recycled Asphalt Pavement (RAP) to virgin aggregates shall not exceed 20% of the total mix.

C. Hot Mix Asphalt Binder Course: Pavement shall meet the minimum requirements of 19.0mm SUPERPAVE Hot Mix Asphalt Binder Course (75 gyrations), with a PG 64-22 Binder, as specified in Section 402, of the current NYSDOT Standard Specifications, with the exception that the maximum proportion of Recycled Asphalt Pavement (RAP) to virgin aggregates shall not exceed 20% of the total mix.

D. The coarse aggregate used in HMA shall be sound, angular crushed stone (crushed or rounded gravel is not acceptable). The fine aggregate shall be well graded, moderately sharp to sharp (angular) sands.

2.4 BITUMINOUS TACK COAT

A. Material shall consist of an asphalt emulsion, Grade RS-1h, and shall meet the minimum requirements of Section 407, of the current NYSDOT Standard Specifications. Bituminous Tack Coat shall be installed over all new and existing concrete and asphalt pavements and structures prior to the installation of new Hot Mix Asphalt materials. The following application rates shall apply:

1.	New Hot Mix Asphalt	0.05-0.07 gal/sy
2.	Milled Surfaces of Existing Asphalt	0.10-0.15 gal/sy
3.	Abutting Vertical Edges (drainage structures, appurtenances)	0.05-0.07 gal/sy
4.	All Styles of Curbs and Gutters	0.05-0.07 gal/sy
5.	Delayed asphalt installation of HMA Courses	0.10-0.15 gal/sy

2.5 PAINTED LINES AND TRAFFIC MARKINGS

A. The extent of the pavement markings shall match the extent, location and composition of pavement markings existing at the site prior to start of work where applicable.

B. The work includes, but is not limited to the following: parking stall divider lines, wheelchair legends, “STOP” legends, “NO PARKING” legends, pick-up zone, striping and legends, directional arrow legends, diagonal striping, center line striping, fire lane striping, student area line striping, and other pavement markings as may be shown on the plans.

C. Provide ready-mixed, one component waterborne traffic line paint. Standard of quality shall be: Pro-Park® Waterborne Traffic Marking Paint B-97 Series as distributed through Sherwin-Williams, 800-474-3794; or Architect approved equal.

1. Colors (as approved by the Owner in writing):

a.	Yellow:	1 Gallon & 5 Gallon, Product Number B97YD2467
b.	White:	1 Gallon & 5 Gallon, Product Number B97WD2434
c.	Blue:	1 Gallon & 5 Gallon, Product Number B97LD2022
d.	Black:	1 Gallon & 5 Gallon, Product Number B97BD2021

2. Paints shall contain all necessary co-solvents, dispersants, wetting agents, preservatives and all other additives, so that paint shall retain viscosity. Halogenated solvents and glass beads shall not be permitted.

3. Volatile Organic Compound (VOC) content shall not exceed 250 grams maximum per liter of paint as determined in accordance with ASTM D 3960 test, excluding water and exempt solvents.

2.6 SELF-ADHERING WATERPROOF MEMBRANE

A. Shall be a composite membrane designed specifically to prevent water from permeating joints and cracks. Product shall be comprised of self-adhering rubberized asphalt and durable poly propylene non-woven fabric with a "peel-n-stick" release. Standard of quality shall be 12" Mirafi MTK as manufactured by TenCate or Architect approved equal.

B. Priming material composed of refined asphalt and rapid drying solvent meeting ASTM D41. Polyguard 650 RC Liquid Adhesive or Architect approved.

C. Contractor to provide 110 linear feet in Base Bid.

2.7 HOT POUR CRACK SEALING AND FILLING

A. Single component, hot applied asphalt crack and joint sealant capable of withstanding temperatures of up to 450° without experiencing polymer degradation.

B. Shall be supplied in solid blocks comprised of heat stabilized polymers and asphalt.

C. Meeting the following material requirements when tested in accordance with ASTM D5329. (see chart below)

Chemical & Physical Analysis

Recommended Application Temperature	350-400°F
Maximum Heating Temperature	450°F
Cone Penetration at 25°C	50 max.
Flow at 60°C, mm	0.
Softening point	200°F Min.
Flexibility 0°F	(1" Mandrel)-Pass
Specific Gravity	1.17
Asphalt Compatibility	Passes

D. Standard or quality shall be Crack Master Supreme as manufactured by Thorworks Industries, Inc., 800-395-7325, www.thorworks.com or approved equal.

3.0 PART 3 - EXECUTION

3.1 PREPARE SURFACE

A. Prior to commencement of asphalt paving, all excavations, drainage, utilities, backfilling, fencing, bollards, storm structures, curbing installations, adjustments, proof-rolling and density test procedures shall be complete to the satisfaction of the Architect.

B. Prior to commencement of tack coat and asphalt paving within pavement milled areas, as shown on the plans, all cracks and joints in the milled pavement surface shall be prepared and filled in accordance with the project specifications. Any oil or grease spots shall be scraped and treated to prevent bleeding through the tack coat.

C. Saw cut, using straight and true lines, all existing asphalt pavements to remain in place with straight, neat edge for abutting against proposed asphalt pavement.

D. Provide and confirm field quality control as described in Section 312201 for pavement subgrade and granular base course stone.

3.2 CONSTRUCT PAVEMENT GRANULAR BASE COURSE

A. General: Consists of placing granular base course material, in layers of specified thickness, over prepared subgrade and fabric to support a pavement course.

B. Grade Control: Provide engineering layout per Section 312201 and grade stakes. During construction, protect grade stakes; maintain lines and grades including crown and cross-slope of each course.

C. Install soil stabilization fabric after subgrade has been acceptably compacted and proof rolled. Install soil stabilization fabric as recommended by the manufacturer AND;

1. Lay fabric in direction of construction traffic.

2. Overlap fabric side to side and end to end a minimum of two (2') feet.

3. Establish reasonable compaction and rut stability before using heavy or vibratory compaction equipment.

D. Placing:

1. Place granular base material over soil stabilization fabric, on prepared subgrade in layers of uniform thickness, conforming to the asphalt pavement details on the drawings.

2. Place granular base material in a maximum of six (6) inch layers and compact with a vibratory or 10 ton smooth wheeled roller.

E. Provide density testing as described in Section 312201.

F. Surface Smoothness: Test finished surface for smoothness. Surface will not be acceptable when it deviates more than 3/8" measured by a 10 foot straightedge, in any direction.

G. The finished grade of the granular base course shall be verified to ensure that the final finished product of the bituminous concrete pavement surface will be installed to the lines and grades of the existing pavements and proposed elevations surveyed by the Contractor prior to the start of the paving work.

3.3 PLACE ASPHALT MIX

A. General:

1. The Contractor shall submit a paving plan, indicating intended direction of paving, number of pulls, etc. for approval prior to the start of paving operations.

2. Joints: Saw cut vertical straight, neat edges for joints required. Joints shall be sharp and clean, conforming to shapes drawn on drawings. Ragged joints will not be accepted.

3. Mill two (2') feet into surface of adjacent asphalt so joints do not line up or "stack".

4. Place bituminous tack coat to all surfaces as indicated in this specification. When pavement surface temperature is above or below the 75-130 degrees F. range, the grade of asphalt emulsion must be modified according to NYSDOT standards. Tack coat shall not be applied to a wet surface or when the pavement surface temperature is below 45 degrees F.

5. Place asphalt on approved prepared surface, spread and strike-off.

6. Spread mixture at minimum temperature of 225-240 degrees F. Place inaccessible and small areas by hand. Hand work shall be minimized to ensure the best possible finished surface.

7. Place each course to required grade, cross-section, and compacted thickness.

8. Paving operations shall not be scheduled when ample time does not exist to place, compact, and finish roll the hot mix asphalt during daylight hours and prior to rainfall.

B. Pavement Placing: Shall be installed in accordance with Section 402-“Hot Mix Asphalt (HMA) Pavements”, of the current NYSDOT Standard Specifications.

C. Paving Equipment:

1. Must be capable of placing, spreading and finishing courses of HMA to the specified thickness.

2. HMA shall be free of marks, segregation and be placed to the required uniform elevation with a smooth texture not showing tearing, shoving, or gouging.

3. Auger extensions are required while pavers are extended beyond the basic screed width.

4. Paving equipment shall be self-propelled and capable of maintaining the line and grade shown on the plans with suitable electronic equipment. The screed shall be straight and true with no bow and utilizing a vibratory screed. Paving equipment should have fully functional screed heaters and joint preheaters.

D. Asphaltic Concrete shall be installed as follows:

1. Medium Duty Asphalt Pavement: Installed in two (2) lifts consisting of 19.0mm SUPERPAVE Hot Mix Asphalt Binder Course overlain by 9.5mm SUPERPAVE Hot Mix Asphalt Top Course.

E. Place in strips not less than ten (10') feet wide, unless otherwise acceptable. In placing each succeeding pass after the placement of the initial pass, the screed of the paver shall be set such that it overlaps the preceding pass by 6" and be sufficiently high such that when compacted, a smooth joint is produced. Prior to pinching the joint, the excess material shall be pushed onto the edge of the new pass with a lute. Excess material shall be removed.

F. After first lift has been placed and rolled, place succeeding lifts and extend rolling to overlap previous lifts. Where possible, top course shall be placed at right angles to binder course and in the direction that the drainage flows. Where this is impractical, offset joints of the two courses by a minimum of two (2') feet so upper and lower joints do not align.

3.4 ROLL ASPHALT MIX

A. General:

1. Rollers shall conform to the manufacturer's specifications for all ballasting. At least one vibratory roller shall be required for each project, with two rollers required as a minimum. (Three rollers shall be required when tonnage is greater than 300 tons/day.)

2. Rollers shall be of a good condition and capable of compacting the HMA to the minimum in-place density required by this specification. Compact asphalt with a nominal 10 ton steel wheel roller or pneumatic rubber tired roller. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

3. Begin rolling when mixture will bear roller weight without obvious or excessive displacement.

B. Finish Rolling: Each lift of the Asphaltic Concrete Pavement shall be mechanically rolled and compacted to the finished thicknesses specified in the Contract Documents. The pavements shall be compacted to a minimum of 94%-97% (95%-102% at longitudinal joints) of the materials theoretical density as determined by AASHTO Method T 209 and an air void percentage of 5%-6% maximum.

C. Patching: Remove and replace paving areas mixed with foreign materials, dirt, and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

D. Joints:

1. The Contractor shall sequence the installation and orientation of all Asphaltic Concrete Pavements such that the minimum numbers of longitudinal and transverse joints are produced and in accordance with the approved Asphalt Placement Work Plan.

2. Neat, straight butt joints between successive passes. Offset joints a minimum of six (6") inches between lifts of asphalt.

3. When repairs or staging of work occurs, make neat vertical saw cut between old and new work to create butt joint. Heat joint prior to pouring. Cold joints are not acceptable.

4. Apply bituminous tack coat to all surfaces and rates indicated under "Bituminous Tack Coat" of this specification section. Tack coat shall not be required on abutting vertical edges for pavements placed in the same day.

5. Minimize construction, longitudinal, and transverse joints left open for an extended period of time.

6. Construct longitudinal joints by paving in a hot fashion with a temperature of not less than 220°F to ensure maximum performance and adhesion.

7. Compact all joints to provide for a neat, uniform and tightly bonded joint that will meet both surface tolerances and density requirements of this specification.

8. Cut straight and true (vertical construction or transverse joints if the material has cooled to less than 220°F prior to the placement of the next pass to ensure the best performing joint possible.

F. Edges: Roll at 45 degrees as detailed, creating clean edge conforming to shapes indicated on the drawings. Ragged edges will not be accepted. Return and saw cut ragged edges at no additional cost to the Owner as directed by the Architect.

G. The final finished grades of the new Bituminous Concrete Pavements must be smooth and true to the contours and shall be installed to the lines and grades of the site prior to start of construction. The final finished grades shall match adjacent pavement surfaces and concrete slabs, aprons, and doorways.

H. Construction Delays (over 48 hours): When placement of the wearing course over the binder course is delayed over 48 hours, thoroughly clean existing surface of dirt, oil and other debris by pressure washing and sweeping. Place bituminous tack coat as specified in this section.

3.5 ASPHALT TOLERANCES

A. Thickness and Density: Compact each asphalt course to produce the thickness indicated on the drawings within the following tolerances:

1. Binder Course: Plus or minus 1/4-inch
2. Wearing Course: Plus or minus 1/8-inch

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. For Asphalt Concrete:
   Binder Course Surface: 1/4"
   Wearing Course Surface: 1/8"

C. Asphalt Cores: Shall be provided as indicated under "Field Quality Control" of this specification.

3.6 FIELD QUALITY CONTROL

A. The Owner's Testing Agency shall provide the following in the daily report at a minimum:

1. Verify the following for the asphalt mix design prior to asphalt placement:

   a. The asphalt mix design has been approved.
   b. The asphalt mix design specifies the minimum relative compaction and the methods required to determine maximum density.

2. Verify the asphalt subgrade has been acceptably proof-rolled. (See Section 312201.)

3. Inspect /test aggregate base course material for in-place density (95%) and thickness. Test materials for gradation classification, and physical properties. (See Section 312201.)

4. Inspect/test asphalt wearing course material for compaction during placement and conduct thickness measurements during lay-down. Take temperature of the asphalt mixture and compare actual temperature with the approved asphalt mixture design range. As a minimum, perform the following inspection/tests:

   a. Collect trip tickets from trucks delivered to the site and verify correct mix design being used for the project.
   b. Temperature tests: one per truck.
   c. Lay down thickness (uncompacted): one per strip or 500 square feet minimum
   d. Verify equipment rolling pattern and passes to ensure proper compaction: one per day
   e. Density test (daily lab density): one test per 5000 square feet minimum
   f. Hot mix samples (laboratory testing for density per ASTM D1188): one per day
   g. Thickness per ASTM D3549 and density samples per ASTM D2950 by a properly calibrated nuclear asphalt testing device. If there is a disagreement between tests done by ASTM D2950 and ASTM D1188, the values done by ASTM D1188 will govern: one test per 20,000 square feet (surface lift), one test per 10,000 square feet (base lift)
   h. Air voids per ASTM D3203 or D2726: one test per 5000 square feet minimum
   i. Verify compaction at the joints and seams. The completed paved surface to be true to grade and cross section. Verify smoothness by using an unleveled 10 foot straightedge and ensuring no gap at any point between straightedge and pavement exceeds surface smoothness requirements above except at interception or at changes of grade.
   j. The screed/lay down thickness tolerance shall be between 1/8 to 3/16 inches greater than the required asphalt minimum layer requirement. When screed depth is set for the exact thickness as specified,

immediately notify the Owner's Representative and Contractor that the installed asphalt thickness may be deficient to achieve the specified minimum thickness. Identify areas of non-complying thickness and attach a drawing identifying the areas to the daily field report.

k. Immediately notify the Owner's Representative and Contractor when paving is being conducted in cold weather and asphalt temperatures are below or above the design mix range.

l. Check the surface grades and drainage patterns. Identify on a drawing all paved areas that are holding water after asphalt placement and notify the Owner's Representative and Contractor. Small ponding areas (bird baths) larger than two (2') feet in any dimension are not acceptable. When this test proves that surface conditions are not acceptable, the Contractor will be responsible for correcting the problem areas. Install a one (1") inch shim coat of wearing course material, or other means acceptable to the Architect.

m. Verify tack coat and edge coat have been applied at the proper rate.

5. Asphalt Cores: Shall be as directed by the Architect.

a. Prior to final acceptance of the asphalt and before pavement markings are placed, the Owner's Testing Agency shall core 3" diameter areas of the asphalt surfacing where directed by the Architect. Consistency, density, thickness, and tensile strength per ASTM D6931 will be evaluated.

b. Patch core areas as directed by the Architect to match adjacent density, texture and thickness.

c. Coordinate day to day scheduling with the Testing Agency.

d. If cores vary significantly from the contract requirements, additional cores will be performed by the Testing Agency as directed by the Architect. Once the overall general quality is determined, provide remedial work as directed by the Architect to achieve the quality and consistence as specified.

B. Unacceptable Paving: Remove and replace unacceptable paving as directed by the Architect, immediately and without argument or delay. Correction of deficient areas in the wearing course shall be done by sawcutting and removal of defective area of work. Tack coat shall be applied to all edges and the pavement shall be replaced. Shimming or skin patching of the wearing course shall not be permitted. Correction of deficient areas within the binder course shall be corrected by sawcutting and milling high spots, and truing and leveling low spots or as directed by the Architect.

3.7 SURFACE PROTECTION

A. Protection: After final rolling and sealing, do not permit any type of vehicular or construction traffic on pavement until it has cooled and hardened as recommended by the producer/manufacturer, minimum of 48 hours.

B. Provide protection including, but not limited to, fencing, traffic cones, barrels, lights, reflective signs, flagpersons and barricades until mixture has cooled and attained its maximum degree of hardness.

3.8 PAINTED LINES AND TRAFFIC MARKINGS

A. Cleaning: Sweep and clean surface to eliminate loose material and dust. Remove dirt, oils and other foreign matter. All surfaces to receive pavement markings shall be clean and in good condition to accept pavement markings.

B. Coordinate provisions for installation with work of other trades.

C. Locate to alignment and dimensions as shown on drawings and/or approved by Owner.

D. Painted markings shall meet regulations described in the "Manual of Uniform Traffic Control Devices", latest edition, as published by NYSDOT, Division of Traffic and Safety, Section 262.25 and figure PM-42; and they shall comply with the most recent version of the Americans with Disabilities Act Standards for Accessible Design.

E. Protect: Adjacent surfaces and other items to remain with tape, drop cloths, or other Architect approved means.

F. Application: Two coats according to manufacturer's recommendations resulting in a dense, opaque application without any ghosting of former pavement markings showing through. Overspraying along edges will not be accepted. Edges shall be sharp and crisp, to the shapes required by the drawings.

1. First coat shall be installed at the recommended DFT (dry film thickness) after paving is in place. The second coat shall be applied at the recommended DFT no later than thirty (30) days after the completion of work.

2. Apply paint materials using clean brushes, rollers or spraying equipment.

3. Apply paint materials as a rate not exceeding those recommended by the paint manufacturer for surfaces being painted, less 10% of losses

4. Comply with manufacturer’s recommendations for drying time between coats. The minimum DFT must be met. Apply additional coats as needed to achieve minimum total specified DFT of the paint system.

5. The minimum required total Dry Film Thickness (DFT): The DFT shall be the minimum required thickness as measured in mils.
6. System coverage requirements minimum total thickness (unless otherwise noted):

    a. 1st Coat – 3.0 mils
    b. 2nd Coat – 6.0 mils

7. Exterior Paint Systems: Provide the following paint systems as indicated: (Colors to be approved by Owner.)

    a. Parking stall, division and limit lines shall be 4” in width, true and straight. Color: White – DFT 6.0 mils
    b. Stop legends shall be as detailed on drawings. Color: White – DFT 6.0 mils

c. Wheelchair legends shall be as detailed on the drawings. Color: Blue background with white symbols. Parking stall striping shall be Blue at handicap stalls only – DFT 6.0mils
d. Diagonal striping Handicapped. Color: Blue – DFT 6.0 mils
e. Diagonal striping Loading Zone. Color: Yellow – DFT 6.0 mils
f. Directional signage shall be as detailed on the drawings. Color: White – DFT 6.0 mils
g. Center line striping shall be 4" in width as detailed on the drawings. Color: White – DFT 6.0 mils

G. Allow 48 hours minimum curing time for paint before allowing traffic on surfaces. Clean up thoroughly including all protective tape, spilled paint, and debris. All parking area marking and painting to be protected by appropriate traffic barriers, lighted if necessary, so located as to prohibit parking and traffic until traffic lines are completed and properly dry.

3.9 SELF-ADHERING WATERPROOF MEMBRANE

A. Surface Protection: Existing pavement surface must be cleaned of all loose dirt and debris and be dry. Cracks wider than 3/8-inch should be filled with suitable crack filler. Severally spalled or other distressed areas must be repaired according to this specification. Note: Commercial crack filler expands under the heat of any overlay and therefore the crack should be filled level or just below the existing pavement surface.

B. Primer: (Surface shall be primed as follows):

1. Primer must be used on all milled surfaces. The liquid adhesive shall be placed on the surface, at a minimum rate of 250 square feet per gallon on milled surfaces.

2. The primer must be completely dry prior to application of the membrane.

3. Primer may be applied using brushes, rollers or by spraying at the prescribed rate of application. Never apply primer to wet or frozen surfaces.

4. Areas primed and not covered with membrane within 24 hours should be re-primed. Smoothness and porosity of existing asphalt surface may affect coverage rate. Do not apply liquid adhesive at heavier rates than recommended,. Excessive material build-up will delay drying and membrane application.

C. Temperature: The surface temperature should be 45 degrees F. and above when installing self-adhering waterproof membrane. Storage temperature should not exceed 125 degrees F.

D. Installation:

1. Center the roll over the joint or crack to be treated with the release paper attached. Allow for a material overrun of 4 to 6 inches beyond each end of the crack to ensure a waterproof seal. Cut the membrane with utility knife. Install the self-adhering membrane by removing release paper.

2. Material should be laid smooth and adhere well to the existing pavement by rolling the membrane with a pickup truck or pneumatic roller. A stiff broom can also be used to aid adhesion.

E. Tack Coat: A standard NYSDOT approved tack coat is applied over the self-adhering membrane and the remaining portion of the surface before placing the hot mix asphalt layer as specified.

3.10 HOT POUR CRACK SEALING AND FILLING

A. The crack must be free from moisture, dust, and loose aggregate. Routing or wire brushing are preferred methods followed by a compressed air heat lance immediately prior to sealing. The substrate and air temperature must be above 45°F.

B. Shall be melted in direct fired or oil jacketed melters. Material should reach recommended pouring temperature of 350-400°F. Fresh material may be added as sealant is used.

C. Apply heated crack filler using either a pump and wand system or a pour pot. For best results the sealant depth to width ratio should not exceed 2 to 1 (i.e. 2-inches deep to 1-inch wide). The cooled sealant height should not exceed 1/8" above surrounding pavement. Using a sealing shoe or squeegee, band the material 2 to 3 inches wide over the crack.

3.11 CLEAN UP

During the contract, and at intervals as directed by the Architect, and as asphalt paving is completed, clear the site of extraneous fabric, gravel, asphalt and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 321201

SECTION 321301 - SITE CONCRETE WORK

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of site concrete work is shown on the drawings and includes formwork, reinforcement, accessories, cast in place concrete, installation of embedded items, finishing, curing, mix designs, testing and acceptance requirements for concrete.

B. Site Concrete work includes, but is not limited to, the following:

1. Concrete walks, pads, and ramps
2. Concrete stairs, turf curb anchor, and seating wall
3. Concrete curb ramps with detectable warning system
4. Concrete footings, bases, foundations, cradles, saddles, collars, and thrust blocks
5. Exterior anchoring cement non-shrink grout
6. Concrete scheduling April 1 to October 15
7. Clean up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321601 – Granite Curb

C. Section 323000 Series - Site Improvements for Athletic Equipment and Furnishings, Metal Bollards, Aluminum Hand and Safety Railing, Steel Hand Railing, Site Furnishings, Vinyl and Galvanized Chain Link Fence, Gates and Backstops, Tension Netting Backstop, etc.

D. Section 331101 - Water Distribution

E. Section 334001 - Storm Drainage

1.3 REFERENCES

A. ACI 301-96 - Specifications of Structural Concrete for Buildings

B. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement

C. ASTM C31 - Standard Practice for Making and Curing Test Specimens in the Field

D. ASTM C33 - Concrete Aggregate

E. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

F. ASTM C94 - Ready-Mixed Concrete

G. ASTM C109 - Test Method for Compressive Strength of Hydraulic Cement Mortars

H. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete

I. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)

J. ASTM C150 - Portland Cement

K. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete

L. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method

M. ASTM C260 - Air Entraining Admixtures for Concrete

N. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete

O. ACI 315 - Details and Detailing Concrete Reinforcement

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Shop Drawings required for:

1. Concrete stairs showing reinforcing
2. Concrete seating wall(s) and/or foundations showing reinforcing

B. Manufacturers Product Data (MPD) and Samples where indicated are required for the following:

1. Expansion Joint and Sealant (Vertical and Horizontal): MPD and Color Samples
2. Water Based Curing and Sealing Compound
3. Slip Dowel System
4. Cold Weather Admixture
5. Hot Weather Admixture
6. Air Entrainment
7. Detectable Warning System
8. Form Release
9. Exterior Anchoring Cement Non-Shrink Grout
10. High Strength Anchoring Epoxy System
11. Concrete Bonding Agent

C. Submit proposed 4,000 psi concrete mix design and test data in accordance with ACI 301 to the Architect for review prior to commencement of the work.

1. Indicate the locations and elements for which the mix will be used.
2. Include in the concrete mix design all required or proposed admixtures necessary to facilitate the installation of the concrete by the means and methods selected by Contractor for this project.

D. Mill test certificates and/or test reports for cement indicating compliance with these specifications.

1.5 QUALITY ASSURANCE

A. Concrete Testing Services: The Owner shall employ an acceptable independent testing laboratory to perform materials evaluation, testing of concrete mixes, and quality control testing. Coordinate day to day scheduling with the testing agency. Field technician shall be ACI Certified Grade 1 Field Technician.

B. Construct and erect concrete formwork in accordance with ACI 301 and 347.

C. Perform concrete reinforcing work in accordance with ACI 301.

D. Perform cast-in-place concrete work in accordance with ACI 301.

E. Conform to New York State Building Code.

F. Field quality control tests are specified in Part 3 - Execution.

1.6 JOB CONDITIONS

A. Job conditions in Section 312201 apply. Provide ample and skilled manpower for concrete installation which is a recognized time sensitive procedure.

B. All concrete work shall conform to American Concrete Institute (ACI) 304R-00 "Guide for Measuring, Mixing, Transporting and Placing Concrete".

C. Do not install concrete work when the temperature of the outside air is below 50 degrees F. and falling unless suitable means acceptable to the Architect are provided to protect work from cold and frost and ensure that mortar and concrete will cure without freezing as indicated in "Cold Weather Concreting" below.

D. Cold Weather Concreting: Provide non-chloride accelerating water reducing admixture in site concrete work placed at ambient air temperatures below 50 degrees F. (10 degrees C.). Comply with International Masonry Industry All-Weather Council cold weather construction and protecting recommendations and American Concrete Institute 306R-10 "Guide to Cold Weather Concreting."

E. Hot Weather: Provide water reducing retarding admixture in site concrete work placed at ambient air temperatures above 80° F. Comply with American Concrete Institute 305R-10 "Guide to Hot Weather Concreting."

F. Construction Review: Notify the Architect/Geotechnical Engineer when stairs, retaining walls, walks, ramps, curbs and pads are formed and ready to receive concrete. Radius form layout shall be inspected and approved by the Architect.

G. Schedule: Unless otherwise directed in writing by the Architect, construct site concrete work from April 1 to October 15. This permits a minimum 30 day dry curing period prior to possible application of deicing chemicals by the Owner.

H. Site concrete work performed between October 16 and March 30 will require an additional written one (1) year guarantee with the understanding that above average concrete deterioration and replacement by the Contractor is likely. Or;
Provide temporary light duty asphalt access paths and replace with permanent concrete during the following April 1 to October 15 timeframe. Both options are at no additional cost to the Owner.

1.7 ADA REQUIREMENTS

A. GENERAL: Concrete work shall comply with the Americans With Disabilities Act as described in the 2010 ADA Standards issued by the Department of Justice (DOJ) and the Department of Transportation (DOT) or latest edition, shall be used.

B. Curb ramp and concrete walk surfaces shall meet the following tolerances:

1. Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes.
2. Thresholds at doorways shall not exceed 3/4" in height for exterior sliding doors or 1/2" for other types of doors. Raised thresholds and floor level changes at accessible doorways shall be beveled with a slope no greater than 1:2.
3. Detectable warning system shall cast in place for the safety and convenience of the visually impaired. Contractor shall have a minimum of three (3) years experience with materials and installation.

2.0 PART 2 - PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES

A. Forms: Either steel or wood, exterior type softwood, PS1, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use forms that are straight and free of distortion and defects, extending the full depth of concrete. Concrete walks which require radius form work shall be set with flexible forms, conforming to the shapes and dimensions as indicated.

B. Lumber: PS 20.

C. Form Ties: Snap-off, metal type of fixed length, cone type.

1. Ties shall be left in place and equipped with swaged washers or other approved devices to prevent seepage of moisture along the tie.
2. Depth of Breakback: Minimum one (1") inch.
3. Unless otherwise noted, provide form ties, which will not leave holes larger than one (1") inch diameter in concrete surface.

D. Dovetail Anchor Slot: Galvanized steel, form filled, release tape sealed slots; bend tab anchors.

E. Form Release Agent: Shall be non-staining and non-residual. Increte Wall Form Release manufactured by Increte or Architect approved equal.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, plain finish, free of rust and/or oxidation. Reinforcing bars shall be bundled and tagged with grades and suitable identification markings, shall be waterproof, and shall not be removed until steel is placed.

B. Steel Welded Wire Reinforcement ASTM A185, plain type:

1. Flat Sheets
2. Mesh size: 6 x 6 (standard W1.4 x W1.4, heavy duty W2.1 x W2.1)
3. Free of rust and/or oxidation

C. Reinforcement Accessories:

1. Tie Wire: FS QQ- W-461 G, annealed steel, back, 16-gage minimum.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. They shall provide sufficient supports at close enough spacing so that the steel will carry the weight of the workmen and the fresh concrete without deformation from its specified location.

D. Fabricate concrete reinforcing in accordance with ACI 315.

E. Slip Dowels: Shall be a slip dowel system comprised of a round dowel sleeve and corresponding base. Standard of quality: shall be Speed Dowel as distributed by A.H. Harris, (860) 216-9500 or Architect approved equal.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type 1 or Type II, Portland type.

B. Aggregates (ASTM C33):

1. Fine aggregates: clean, sharp, natural sand.
2. Coarse Aggregates: 3/4" maximum size stone meeting the requirements of New York State Department of Transportation Specification 703.02.

C. Water: Clean and not detrimental to concrete.

2.4 ADMIXTURES

A. Calcium Chloride in concrete is prohibited.

B. Air Entrainment Admixture: ASTM C260, Darex AEA ED or Architect approved equal.

C. Water Reducing Admixture: ASTM C494, Type A; not containing more chloride ions than are present in municipal drinking water.

D. High Range Water Reducing Admixture: ASTM C494, Type F or G; not containing more chloride ions than are present in municipal drinking water.

E. Cold Weather Accelerating Admixture: (Ambient temperature below 50°F.) Non-chloride water reducing accelerating admixture, ASTM C494, Type C, PolarSet as manufactured by WR Grace & Co. or Architect approved equal. Mix at rates recommended by the manufacturer. No reduction in compression rating of the concrete is permitted.

F. Hot Weather Water Reducing and Retarding Admixture: (Ambient temperature above 80° F.) Shall be Daratard series admixture, ASTM C494, Type D, as manufactured by WR Grace & Co. or Architect approved equal. Mix at a rate recommended by the manufacturer. No reduction in compression rating of the concrete is permitted.

2.5 RELATED MATERIALS

A. Expansion Joints:

1. For Radius Applications: Expansion joint filler shall be polyethylene closed cell backing with peel off strip, X-Foam as manufactured by W.R. Meadows or Architect approved equal.
2. For Straight Applications: Expansion joint filler shall be fiber expansion joint with peel off snap-cap, as manufactured by W.R. Meadows or Architect approved equal.

B. Caulking for flat slabs shall be one part elastomeric self leveling polyurethane gray sealant Pourthane SL or Architect approved equal. Caulking for vertical surfaces shall be one component elastomeric gun grade polyurethane sealant Pourthane NS, color as selected by the Owner to match wall stain or Architect approved equal.

2.6 COMPOUNDS, HARDENERS, AND SEALERS

A. Water Based, Acrylic, Curing and Sealing Compound: ASTM C309, Type 1, Class A and B, clear or translucent. Standard of quality shall be VOCOMP-20 as manufactured by W.R. Meadows or Architect approved equal.

2.7 CONCRETE MIX

A. Mix and deliver ready-mix concrete in accordance with ASTM C94.

B. Concrete:

1. Compressive Strength (Minimum at 28 days): 4,000 psi
2. Slump (Maximum): 2 to 4 inches
3. Air Entrainment: 5-8.5%
4. Flexural Strength (ASTM C78): 650 psi at 28 days.

C. Use water-reducing admixture in all concrete.

D. Water/Cement Ratio: Maximum 0.42 for 4,000 psi concrete.

E. Cement Factor Per Cubic yard: Minimum 560 lbs. for 4,000 psi concrete.

1. Substitution of fly ash for cement is prohibited.

F. Maximum Size of Coarse Aggregate:

1. General Work: Per ACI 301, 3/4" maximum.

G. Select admixture proportions for normal weight concrete in accordance with ACI 301.

H. Add air-entraining agent to concrete mix for all concrete work exposed to exterior.

2.8 MIXING WATER CONTROL

A. The quantity of mixing water used in the concrete mix shall be determined by the Contractor, except that the Architect/Geotechnical Engineer may direct that such quantity of water be reduced if the slump of the concrete exceeds the specified slump. The Contractor's determination of the quantity of mixing water shall conform to the various limits on water/cement ration and slump specified. Concrete consistency shall be uniform from batch to batch.

B. During the course of the work, the batch plant will make quantitative measured moisture determinations of the aggregates utilized in each batch. Aggregate weights and batch water requirements shall be adjusted accordingly for measured aggregate moisture content.

C. When concrete is transported in units approved for mixing, the addition of not more than 10% of the total design water will be permitted at the job site to obtain initial slump.

1. Any addition of water shall be followed by mixing of at least 30 revolutions in the mixing speed range.
2. No more than two additions of water at the point of deposition before discharge shall be allowed.
3. No retempering of the concrete will be permitted. Retempering is defined as the addition of water after the mix has attained its desired initial slump.

2.9 DETECTABLE WARNING SYSTEM

A. Cast in place vitrified polymer composite (VPC) detectable/tactile warning tiles shall be an epoxy polymer composition with aluminum oxide particles in the truncated domes. Standard of quality shall be Armor-Tile 24" x 48" cast-in-Place Inline Dome Tactile Tile (ADA-C-2448) as manufactured by Engineered Plastics, Inc. 800-682-2525 or Architect approved equal.

B. Color shall be colonial red (Federal No. 20109) or Architect approved equal.

C. Guarantee period shall be five (5) years from substantial completion including defective work, breakage, deformation, heave, and loosening tiles.

2.10 EXTERIOR ANCHORING CEMENT (NON-SHRINK GROUT)

A. For Steel Posts, Fencing and Other Non-Aluminum Elements: Shall be an exterior grade anchoring cement (non-shrink grout) with a min. compressive strength (ASTM C-109) of

7,200 psi at 28 days. Standard of quality shall be Super Por-Rok as manufactured by CGM, Inc., www.cgmbuildingproducts.com, or Architect approved equal.

B. For Aluminum Posts and Elements: Shall be an exterior grade anchoring cement (non-shrink grout) with a min. compressive strength (ASTM C-109) of 7,200 psi at 28 days. Standard of quality shall be Por-Rok as manufactured by CGM, Inc., www.cgmbuildingproducts.com, or Architect approved equal.

2.11 HIGH STRENGTH ANCHORING EPOXY SYSTEM

A. A two-component vinylester adhesive anchoring system. The system includes injection adhesive in plastic cartridges, mixing nozzles, dispensing tools and hole cleaning equipment.

B. Designed for bonding threaded rod and reinforcing bar elements into drilled holes in concrete and masonry base materials.

C. Standard of quality shall be AC100+ GOLD Vinylester Injection Adhesive Anchoring System as distributed by A.H. Harris, (315) 414-0340, or Architect approved equal.

2.12 CONCRETE BONDING AGENT

A. Shall be a concrete bonding adhesive specifically formulated for permanently bonding new concrete to old concrete in exterior applications.

B. Concrete bonding adhesive applied to appropriate substrates will achieve tensile bond strengths typical of 150 psi in 28 days.

C. Standard of quality shall be Quickrete Concrete Bonding Adhesive or Architect approved equal.

3.0 PART 3 - EXECUTION

3.1 CONCRETE WALKS, PADS, AND RAMPS

A. Surface Preparation: Remove loose material from the compacted subgrade surface immediately before placing concrete. Remove any standing water, mud, debris, frost, snow, ice from surfaces upon or against which concrete is to be placed.

B. Proof-roll prepared subgrade surface to check for unstable areas and the need for additional compaction. Do not begin concrete pour until such conditions have been corrected, subgrade is compacted to 95% and ready to receive concrete.

C. Form Construction: Construct to required size and shape. Brace and secure to maintain alignment, elevation and position. Check completed formwork for grade and alignment, prior to installing concrete. Clean forms as needed to removed foreign matter.

D. Install welded wire mesh on concrete brick or mesh chairs to proper level in maximum lengths possible. Offset end laps in both directions. Splice laps with tie wire. Lifting mesh after concrete pouring is not acceptable.

E. Prepare concrete mixture including the following:

1. Add hot weather or cold weather admixture to accommodate field weather conditions.

F. Concrete Testing: Will be performed as described in Part 3, "Field Quality Control" of this specification section.

G. Conveying:

1. Convey concrete by means that will prevent segregation and loss of mortar form the mix.
2. Provide adequate manpower and equipment in the form of buckets, buggies, chutes, conveyors or other approved means to assure continuous operation.
3. Convey concrete so that no equipment with aluminum parts comes in contact with fresh concrete.

H. Concrete Placement: Do not place concrete until subgrade and forms have been checked for line and grade. Moisten granular base course as required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they have been brought to the required finish grade, alignment, and expansion joints have been installed.

I. Spread concrete as soon as it is deposited on the granular base course, using methods which prevent segregation of the mix, and with as little rehandling as possible. Consolidate concrete along the face of forms. Consolidate with care to prevent dislocation of mesh, reinforcing and joint materials.

J. Install Concrete Walk Joints:

1. Construct expansion and contraction joints as detailed and as shown on plans. Concrete joints that do not follow the pattern(s) shown on the plans and/or changes that have been approved by the Architect will be removed and replaced at no additional cost to the Owner.
2. When the walkway is abutting existing walks, place transverse joints to align with previously placed joints, unless otherwise shown.
3. Contraction Joints: Approximately 5' on center. Break walk into individual slabs of not more than twenty-five (25 sf) square feet with jointing tool, round edges. Saw cut scoring pattern (contraction joints) to depth shown on details for each type of concrete work with new, sharp concrete sawblade one day (24 hours) after the pour. Joint cuts to be clean, sharp, uniformly made cuts to achieve scoring pattern as shown and detailed. Note: When tooled joints or saw cutting is not performed as described, an extended three (3 yr.) year written guarantee or credit for defective work will be required as determined by the Architect at no additional cost to the Owner.
4. Expansion Joints: Provide where abutting building(s), columns, structures, concrete paving and curbs, catch basins, manholes, inlets, walks, walls, other fixed objects and as directed by the Architect.
5. Locate expansion joints at thirty feet on center (30' o.c.) for each walkway lane, unless otherwise shown. Provide slip dowels as detailed and specified.

6. Locate expansion joints with slip dowels at all flush building access points, whether specifically shown on drawings or not.
7. Extend joint fillers full width and depth of the joint, flush with finished pavement grade, and not less than 1/4" or more than 1/2" below the finished pavement surface. Joint surfaces shall be clean and dry prior to installation of sealant as per manufacturer's recommendations. Remove excess sealant on surfaces adjacent to joint.

K. Concrete Finishing:

1. Perform concrete finishing using machine or hand methods as required.
2. After striking off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
3. After floating, test surface for trueness with a ten (10') foot straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous, smooth finish.
4. Work edges of slabs and joints with a 1/8" radius edging tool, two (2") wide, unless otherwise shown.
5. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows.
6. Broom finish, by drawing a medium hair broom across the concrete surface as detailed. Repeat operation when required to provide a medium texture acceptable to the Architect.
7. For handicap curb ramps, tool grooves along sloping surfaces in line with drainage flow as detailed.
8. Curing: Refer to schedule noted in 1.6, above.

    a. Immediately after placement, protect concrete form premature drying.
    b. Remove all dirt, dust, oil, grease, asphalt and foreign matter. Cleanse with caustics and detergents as required. Rinse thoroughly and allow to dry.
    c. Stir curing compound thoroughly before using.
    d. Apply a continuous, uniform film by solvent-resistant low pressure spray only, short-nap roller or lamb's wool applicator. For best results, use a canister curing compound sprayer. Use spray tip number 8004 or equivalent for water-based or waterborne products.
    e. For curing, apply first coat evenly and uniformly as soon as possible after final finishing. Apply second coat when all construction is completed and structure is ready for occupancy.
    f. When soil contamination occurs, notify the Architect immediately in writing. Remove contaminated soils and legally dispose of, provide soil test(s), replace soil, plantings and lawns at no additional cost to the Owner.

L. Detectable Warning System:

1. Pour and float concrete, set tile by tamping grid pattern down into the concrete until all air voids are removed with a rubber mallet.
2. Place two cinder blocks or 25 lbs weights on the tile to prevent floating.

3. Create an edge around the perimeter of the tile using a 3/8" radius edging tool then float the concrete around the tile's perimeter using a steel trowel.
4. After concrete has cured, remove protective plastic wrap.
5. Protect tiles against damage during construction and clean tiles as recommended by the manufacturer.

3.2 CONCRETE TURF CURB ANCHOR

A. General: Concrete Turf Curb Anchor shall meet the requirements specified for concrete in this Section, Item 3.1 above. Install forms true to line and grades given on plan. Provide permanent in place expansion joints using pre-molded expansion joint filler thirty feet (30' o.c.) on center, maximum. Install reinforcing bars as detailed. Remove forms in twenty-four (24) hours. Saw cut the contraction joints approximately 10' on center 1-1/2" deep with a new sharp concrete saw blade the next day after the pour along top and both faces of curb. Note: When the sawcutting is not performed as described, an extended written guarantee or credit for defective work will be required by the Architect.

B. Finishing: Remove ties and patch tie holes, including those below grade. Remove fins and patch minor voids. Chip out major stone pockets and repair. Rub surface smooth with carborundum brick dipped in neat cement grout to fill pin holes. Trowelled on cement plaster is prohibited. After drying, rub off excess cement dust with burlap.

C. Curing: See 3.1, above.

3.3 CONCRETE STAIRS

A. General: Concrete stairs shall meet the requirements specified for concrete in this Section, Item 3.1, except as noted below.

B. Verify that lines, levels, locations and form dimensions comply with drawings and submittals.

C. Design, erect, support, brace, and maintain formwork to support applied vertical and lateral loads. Construct formwork to provide correct size, alignment, elevation, pitch on tread, and position of concrete work.

D. Design and erect formwork to permit removal without damage to cast-in-place concrete surfaces and adjacent materials during stripping .

E. Install, align, and level forms. Support and brace forms in place.

F. Coat form surfaces with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage. Apply before placing reinforcing steel, anchoring devices, and embedded items.

G. Provide reinforcing bars adequately supported and secured to prevent displacement.

H. Placement of concrete shall be in layers not to exceed 18 inches without consolidation with the aid of mechanical vibrating equipment. To achieve even and dense surfaces, free of aggregate pockets or honeycomb, vibration shall be supplemented by spading by hand in the corners and angles of forms and along surface while concrete is plastic under

the vibratory action. Placement of concrete shall conform to recommendations of ACI 309 "Recommended Practice for Consolidation of Concrete".

I. Install, set, and build-in items furnished by other trades. Provide adequate notification for installation of necessary items. Coordinate with reinforcing, safety railings and hand railings.

J. Remove ties and patch tie holes, including those below grade. Remove fins and patch minor voids. Chip out major stone pockets and repair. Rub surface smooth with carborundum brick dipped in neat cement grout to fill pin holes. Trowelled on cement plaster is prohibited. After drying, rub off all excess cement dust with burlap.

K. Medium broom finish stair treads with strokes perpendicular to flow of pedestrian traffic, similar to walks. Other exposed concrete surfaces shall be rub finished similar to concrete curb.

L. Cure and seal as specified in this section, item 3.1 above.

M. Strip Forms and Bracing: Three (3) days minimum before stripping. It is the Contractor's responsibility to determine the time at which forms may be removed without damaging the stairs and only after concrete has gained sufficient strength to carry its own weight and imposed loads.

3.4 CONCRETE SEATING WALL(S)

A. General: Concrete seating wall(s) shall meet the requirements specified for concrete in this specification section, Item 3.1, except as noted below.

B. Verify that lines, levels, locations and form dimensions comply with drawings and submittals.

C. Design, erect, support, brace, and maintain formwork to support applied vertical and lateral loads. Construct formwork to provide correct size, alignment, elevation, pitch on tread, and position of concrete work.

D. Design and erect formwork to permit removal without damage to cast-in-place concrete surfaces and adjacent materials during stripping . Thoroughly clean forms and adjacent surfaces to receive concrete. Remove sawdust, dirt or other debris before placing concrete. Tighten forms and bracing to prevent mortar leaks and maintain proper alignment.

E. Install, align, and level forms. Support and brace forms in place. Provide watertight joints, sealed to prevent leakage. Rustication strips are recommended at construction joints or between pours. Chamfer exposed corner and edges as detailed, using wood, metal PVC or rubber chamfer strips fabricated to provide uniform smooth lines and tight edge joints.

F. Provide reinforcing bars adequately supported and secured to prevent displacement. Splices in reinforcing bars shall conform to ACI 318 and stagger splices wherever possible.

G. Seams: Liner butt joints shall be carefully blended into the approved pattern. No visible vertical or horizontal seams or conspicuous marks created by butt jointing form liners will be allowed. Work to conform to approved sample.

H. Placement of concrete shall be in layers not to exceed 18 inches without consolidation with the aid of mechanical vibrating equipment. To achieve even and dense surfaces, free of aggregate pockets or honeycomb, vibration shall be supplemented by spading by hand in the corners and angles of forms and along surface while concrete is plastic under the vibratory action. Placement of concrete shall conform to recommendations of ACI 309 "Recommended Practice for Consolidation of Concrete".

I. Install, set, and build-in items furnished by other trades. Provide adequate notification for installation of necessary items. Coordinate with reinforcing, safety railings and hand railings.

J. Strip Forms and Bracing: Stripping form liners shall be done within three (3) days. It is the Contractor's responsibility to determine the time at which forms may be removed without damaging the walls or weakness to the substrate and only after concrete has gained sufficient strength to carry its own weight and imposed loads.

K. Install drainage behind seating wall, and retaining wall granular backfill to 95% compaction behind wall as detailed and specified in Section 312201.

L. Patches: Fill tie holes and defects in concrete surface within 48 hours of form removal. Use the same patching materials and techniques that were approved on mockup. Make patches with a still mortar made with materials from the same sources as the concrete. Adjust mortar mix if necessary to lighten it.

M. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces NOT exposed to view in the finish work or concealed by other construction.

N. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces to view or to be covered with a coating or covering material applied directly to the concrete, such as waterproofing, veneers or painting. Repair and patch defective areas with fins and other projections.

O. Rubbed-Finish:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 26 hours.

P. The surface shall be sealed with the approved sealer, per manufacturers instructions, if first approved by the Owner

3.5 FOOTINGS, BASES, FOUNDATIONS, SADDLES, CRADLES, COLLARS, AND THRUST BLOCKS

A. Footings, Bases, Foundations: Locate and provide where shown on drawings and as detailed.

B. Saddles: Locate and provide where shown on drawings or where vertical distance between crossing pipes is eighteen (18") inches or less. Construct saddles springline (centerline) to springline and full width of trenches.

C. Cradles: Locate and provide where shown on drawings. Construct cradles the full width of the trench, six (6") inches below the pipe and on both sides of the pipe up to the springline.

D. Collars: Locate and provide where shown on drawings or where pipe slopes exceed ten (10%) percent. Construct collars one (1') foot thick, full width of trench plus one (1') foot extension each side, above and below pipe.

E. Thrust Blocks: Locate and provide where shown on drawings. Also for sanitary force main and water pipes at (1) connections to existing systems, (2) at changes in horizontal alignment of 22-1/2 degrees or more, and (3) at tees, crosses, valves, hydrants and plug (end of pipe) conditions. Block and anchor with concrete so that there will be no movement of the pipe in the joints due to internal or external pressures. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6" below the fittings of pipe, to 12" above the fittings. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be recaulked or tightened if necessary. Concrete thrust blocks shall conform dimensionally to details shown on drawings.

3.6 INTERRUPTION OF CONCRETING

A. Should placing concrete be suspended or unavoidably interrupted, provide key ways and bulkheads to prevent feather-edging when work is resumed. Roughen horizontal surface for bond.

3.7 REPAIR AND PROTECTION FOR CONCRETE WORK

A. Cut out and replace defective concrete work which has blisters, cracking, crazing, curling, discoloration, dusting, efflorescence, low spots, pop outs, scaling or mortar flaking, spalling, settling, or heaving as defined by Portland Cement Association 2001, "Concrete Slab Surface Defects" and as directed by the Architect.

B. Modify or replace concrete not conforming to the required lines, details, elevations and specifications as directed by the Architect.

C. Protect the work from damage until acceptance of the work. Exclude traffic from concrete work for at least fourteen (14) days after placement. When construction traffic

is permitted, maintain concrete as clean as possible by removing surface stains and spillage of materials as they occur.

3.8 ANCHORING RAILINGS AND POSTS INTO CONCRETE

A. Aluminum posts **must** be coated or treated with a good sealer or paint prior to anchoring.

B. Drill the hole as detailed. Blow out all dust and loose particles.

C. Fill the hole with water. Scrub the sides and bottom of the hole and with a stiff wire brush such as a bottlebrush. This is important.

D. Remove excess water with rag or other absorbent materials. Leave the hole clean and uniformly damp.

E. Mix the anchoring cement in a clean container to flowable consistency based on the following formula. For best results, measure accurately. The correct amount of water is as follows:

2.3 oz per lb
11.5 oz for 5 lbs
115 oz for 50 lbs
7 quarts for 100 lbs

Measure the amount of anchoring cement and water to be mixed. Add the measured amount of water to the appropriate amount of cement and mix until the desired consistency is achieved. (NEVER USE MORE WATER THAN PRESCRIBED). This will reduce the ultimate strength, increase the possibility of volume instability and may cause the product to become soft and less durable.)

F. Fill the hole with the plastic cement first, and then tamp the bolt, post or rod with a twisting motion into place. If the material becomes too fluid during the tamping process and sags out of place, let it stand for a few minutes and it will stiffen. Smooth out the surface around the bolt with spatula or trowel.

G. Let the cement harden for at least 60 minutes. For heavy equipment, allow 4 hours prior to use or loading.

3.9 ANCHORING BOLTS, DOWELS, AND REBAR INTO CONCRETE

A. Anchor Hole Preparation: Prepare all anchor holes prior to placement of anchoring epoxy. Hole diameter is typically 1/8" (3 mm) greater than the anchor diameter. Hole depth is typically nine times anchor diameter. Required minimum anchor hole depth is 6". Consult project specifications and details. Drill hole to proper diameter and depth and blow all dust from the bottom of the hole, brush and blow (4x) repeatedly to remove all dust and debris. The anchor hole must be clean and free of standing water prior to placement of material.

B. Application: Use only professional caulking gun. Remove plastic cap and plugs from cartridge. Save for closing cartridge. Attach mixing nozzle to cartridge. Discard small amount of gunned product until uniform color is achieved. Mixing nozzle will harden in approximately 20 min. if not in use.

C. Hardened nozzle must be discarded. Dispense the epoxy at the bottom of the hole while withdrawing nozzle. Dispense epoxy (typically filling 5/8 of hole) so that once threaded rod or rebar is inserted, the hole is completely full. Insert threaded rod or rebar to the bottom of the hole while turning clockwise. Promptly remove any excess material. Leave anchor undisturbed for 6 hours (at 77°F /25°C), or longer for colder temperatures. Load can be applied 8 hours at 77°F (25°C).

3.10 CONCRETE BONDING AGENT

A. Required at elements where new concrete is applied and joined to existing concrete.

B. Surface Preparation:

1. Apply only to clean, sound, dry surfaces.
2. Remove dust, dirt, oil, grease, wax, unsound concrete and plaster, paint, and other foreign materials.

C. Applications:

1. Apply to a dry surface with brush, roller or spray to the thickness of a coat of paint.
2. Place new concrete, topping mixes, Portland cement, or patches as soon as the adhesive is dry.
3. Make sure basecoat is dry before applying adhesive.
4. Tools, brushes and other application accessories should be immediately cleaned with soapy water. Use hot water to clean up any drippings.

3.11 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed by ACI certified technicians; Grade 1. Certificates shall be submitted to the Architect for persons performing inspection and testing prior to the start of work.

B. Field Inspection and testing shall be paid for as directed under 1.5 "Quality Assurance". Where retesting, additional inspection, lab tests or other professional services are required due to rejected work, any cost associated therewith will be solely at the Contractor's expense.

C. The Contractor shall plan his operations to allow adequate time for all required testing and inspection.

D. The Contractor shall provide facilities and equipment necessary to obtain and handle representative sample of materials to be tested.

E. The testing laboratory shall be responsible to the Owner for the field control of all concrete and may reject batches because of high slump, uncontrolled air entrainment, delays or other conditions of non-compliance with these specifications.

F. Sampling and Field testing will be performed during concrete placement per ASTM C31, C39, C143, C172 and C173.

G. Five (5) Concrete Test Cylinders: Taken for every 30 or less cubic yards of concrete placed are required or a fraction thereof;

1. Two (2) Cylinders will be tested at 7 days, two (2) cylinders will be tested at 28 days and one (1) cylinder will be held for possible testing at a later time.

H. One (1) Additional Test Cylinder: Taken during cold weather concreting, to be cured on the job site under the same conditions as placed concrete it represents, is required.

I. Air Content Test: Taken for each set of test cylinders taken, is required.

H. One (1) Slump Test: Taken for each set of test cylinders taken is required.

K. Test results will be reported by telephone to the General Contractor and Architect on same day tests are made. Written report with copies will follow to the Owner, Architect, and Landscape Architect. Email copies of laboratory test, evaluation reports for concrete materials and mix designs will be submitted.

3.12 CLEAN UP

During the contract and at intervals as directed by the Architect and as concrete work is completed, clear the site of gravel, concrete, appurtenances and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 321301

SECTION 321601 - GRANITE CURB

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of granite curb is shown on the drawings.

B. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321201 - Asphalt Paving

B. Section 321301 - Site Concrete Work

1.3 SUBMITTALS: (See Section 311201, 1.5)

A. Provide material certificates showing granite curb source and that material meets product specification in Section 2.1 below.

1.4 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Construction Review: Mark location in field for review by Architect prior to setting granite curb.

2.0 PART 2 - PRODUCTS

2.1 GRANITE CURB

A. Shall be hard, durable, light grey in color and free from seams which would impair its strength. The curb shall be sawed top and split face. No drill marks shall appear on the exposed face. Minimum length shall be 2 ft.; maximum 8 ft. Curbs set to a radius of less than 100 ft. shall be cut to the curve required. Maximum length on curves shall be four feet.

B. Provide project specific granite types:

1. Vertical Curbs:
   a. Standard: 5" x 16"
2. Vertical Curb Corners (for radius 3'-0" or less)
3. Transition Curb

C. Standard of quality: As manufactured by Geneva Granite Co. (315) 789-8142 or Architect approved equal.

2.2 WET CONCRETE SETTING BED

Shall be 4000 psi as specified in Section 321301, 2.3, 2.4.

2.3 GRANULAR BASE COURSE

As specified in Section 312201, 2.1, B.

2.4 MORTAR

Shall be one part Portland cement, one part lime and three parts mason's sand by volume.

2.5 DRY MIX CONCRETE

Shall be Portland cement dry, mixed in the proportions of, one part Portland cement to three parts of concrete sand and six parts of coarse aggregate (passing 1-1/2" screen).

3.0 PART 3 - EXECUTION

3.1 SETTING CURB

A. Curbing shall be set leveled on a 6 inch dry mix concrete setting bed foundation.

B. Set granite to line and grade as shown on the plan. Provide continuous wet concrete backing both sides of curb. Joints shall be a minimum of ¼" and shall be fully mortared from face to back of curb. Bevel corners to 45 degrees with a mitered joint.

C. Set curbs to the line and grade given in a smooth curve or straight line. When curbing ends, it shall transition from a six (6") inch reveal to no reveal meeting finished grade.

D. Curbing shall be set, backfilled, and compacted to ½ the height on the sidewalk face to prevent movement when backfilling is placed. Once the paving has been rolled, the remaining fill shall be placed and compacted to avoid future settlement of the walk.

E. Pointing: The joints between curb stones shall be carefully filled with cement mortar and neatly pointed on the top and front exposed curb portions. Remove excess mortar and clean curb.

F. Backfill curbing with wet concrete each side of the curb stone and all spaces under the curb shall be filled with concrete so that the entire unit is completely supported.

3.2 CLEAN UP

During the contract and at intervals as directed by the Architect and as granite curb installation is completed, clear the site of extraneous granite curb, concrete, gravel, asphalt and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 321601

SECTION 321800 – SYNTHETIC TURF

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of synthetic turf work is shown on the drawings.

B. Synthetic turf work includes, but is not limited to, the following:

1. Drainage blanket surface inspection and approval
2. 2 ¼" pile height dual parallel-long slit film and monofilament polyethylene blended fiber turf stitched into a primary and secondary backing.
3. Tufted-in game lines and perimeter lines. Remaining required game markings and logos shall be permanently inlaid or painted as specified.
4. Resilient infill system, consisting of a mixture of rubber granules and silica sand.
5. Maintenance manual and onsite maintenance training
6. G-max testing prior to Owner use of facility
7. Twelve (12) year manufacturer's warranty
8. Revisiting site for future G-max testing and infill adjustments
9. Clean up

C. Provide all labor, materials, tools and equipment necessary to install synthetic grass system as indicated on the plans and as specified.

D. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instructions and in accordance with all approved shop drawings and submittals. The final product shall be a well-draining, even playing surface free of distortion, inconsistent infill levels, and other imperfections.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 323001 - Athletic Equipment and Furnishings

C. Section 334001 - Storm Drainage

1.3 REFERENCES

A. FM P7825 - Approved Guide; Factory Mutual Research Corporation: current edition

B. ASTM Standard Test Methods:

D1577 - Standard Test Method for Linear Density of Textile Fiber
D5848 - Standard Test Method for Mass per Unit Area of Pile Yarn Floor Covering
D418 - Standard Test Method for Testing Pile Yarn Floor Covering Construction
D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
D2256 - Standard Method of Test for Tensile Properties of Yarns by Single Strand Method

D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
F355A - Standard Test Method for Shock-Absorbing Properties of Play Surfaces
F355E - Standard Test Method for Standard Test Method for Impact Attenuation of Playing Surface Systems, Other Protective Sport Systems, and Materials Used for Athletics, Recreation and Play
F1936 - Standard Test Method of Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
F1551 - Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials
F2765 - Standard Specification for Total Lead Content in Synthetic Turf Fibers
D5603 - Standard Classification for Rubber Compounding Materials-Recycled Vulcanizate Particulate Rubber

C. European Standard EN-71-3 - Safety of Toys Part 3: Migration of Certain Elements.

D. National Federation of State High School Associations (NFHS) Rules and Interpretations, latest edition.

E. Synthetic Turf Council (STC): Suggested Guidelines for the Essential Elements of Synthetic Turf Systems, latest edition and Guidelines for Crumb Rubber Used in Synthetic Turf Fields, latest edition.

F. American Sport Builders Association (ASBA): Sports Fields - A Construction and Maintenance Manual, latest edition.

1.4 SUBMITTALS (See Section 311201, 1.5)

A. Prior to the Architect approval of specified synthetic turf system, submit the following within seventy two (72) hours of bid opening, as requested:

1. Submit two (2) 12” x 12” rag samples of proposed synthetic turf carpet and two (2) 12” x 12” boxed turf samples including infill representative of finished synthetic turf system.

2. Certified copies of independent (third-party) laboratory reports on ASTM tests as follows:

a) Specific Gravity, ASTM D792
b) Tuft Bind, ASTM D1335
c) Grab Tear Strength, ASTM D1682 or D5034
d) Pile Height, Face or Pile Weight & Total Fabric Weight, ASTM D418 or D5848
e) Primary & Secondary Backing Weights, ASTM D418 and D5848
f) Flammability (Pill Test), ASTM D2859

g) Water Permeability, ASTM F1551
h) Yarn Breaking Strength, ASTM D2256

3. List of five (5) similar existing (in play) installations using the same turf fibers that have been installed in the Northeast Region of the United States including, Owner representative and telephone number(s).

4. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide a letter showing evidence that their turf system does not violate any other manufacturers' patents, patents allowed or patents pending.

5. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide three (3) copies of a current 3rd party, NON-CANCELABLE warranty insurance policy, supported by an A-Rated domestic insurance carrier, with a policy minimum claim limit of at least $1,000,000. and annual aggregate limit of at least $15,000,000. in order to fully cover the full replacement of the turf system in the event of total failure. Actual policy must be submitted for approval.

6. Letter stating the products expected useful life under normal use conditions defined in the manufacturer's warranty.

7. A letter and specifications sheet certifying that the products in this section meet or exceed specified requirements including certification from the turf manufacturer that lead or lead chromate are not used in the manufacturing of the specified system.

B. Submit the following prior to ordering of materials:

1. Shop Drawings (to scale) indicating:

a) Colored Field Layout and Field Marking plan for the specified NFHS sports.
b) Colored Logo / Lettering Designs and Dimensions.
c) Roll/Seaming Layout
d) Methods of attachment, field openings and perimeter conditions.

2. Material Certificates: Provide material certificates for each material used in the turf system from the turf manufacturer that will be used for this project including, but not limited to, type and composition of fiber(s), primary and secondary backing, and urethane(s).

3. Samples: Submit two (2) 12" x 12" samples of each turf color specified to be used for tufted and inlaid lines / logos. Tufted and Inlaid turf shall match the specified synthetic turf system. Provide two (2) bagged samples each of rubber and sand infill material.

4. Supplier Certification that crumb rubber infill (CRI) being used for the turf system is from only used, whole, vulcanized automobile, SUV, or truck tires and produced in compliance with North American tire manufacturing specifications. Include documentation of compliance with EN-71-3 Standard for Children's Toys

as indicated in Part 2, Paragraph 2.1, D. Include documentation of compliance with ASTM D5603-01 as indicated in Paragraph 7.3.2.

5. The Turf Contractor and Turf Manufacturer (if different from the company) shall provide a sample warranty that meet requirements in 1.8 of this section.

6. Submit copies of proposed installation foreman's resume. Installation crew must meet or exceed all requirements outlined in 1.8 of this section.

C. Provide crumb rubber infill (CRI) order certification noting type and origin of raw material, production facility, production method, fiber content (%), and CRI sieve and gradation analysis. All supersacks shall provide traceability to date of production and origin of processing.

D. No reclaimed infill, sand or rubber, from other synthetic turf field installations are permitted.

E. Prior to Final Acceptance, the Turf Contractor shall submit to the Architect / Owner:

1. Independent G-Max test results and a letter indicating compliance with future G-Max testing as specified in 1.5 of this Section.

2. Three (3) copies of Maintenance Manuals, which will include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.

3. Recommended Maintenance schedule provided by vendor for first three (3) years after installation.

4. Synthetic Turf Warranty: Submit twelve (12) year fully executed Manufacturer Warranty and ensure that forms have been completed in Owner's name and registered with Manufacturer and Insurance carrier. This includes the Certificate of Insurance from the Insurance Carrier confirming that the third-party insurance policy, non-cancelable and pre-paid is in effect covering this installation and is in force.

1.5 QUALITY ASSURANCE

A. Turf Manufacturer Qualifications: Company specializing in manufacturing of products specified in this section. The Turf Contractor and/or the Turf Manufacturer:

1. Must be experienced in the manufacture and installation of this specific type of synthetic infill fiber grass system including fibers, backing, backing coating, adhesives, infills and installation methods at exterior sites over the last three (3) years.

2. Must have a minimum of five (5) exterior fields installed with the same synthetic infill fiber grass system still in use and fields should be a minimum of 65,000 square feet in size.

B. Turf Installer Qualifications: Company specializing in performing the installation work of this section.

1. The Turf Contractor must have been in business (under its' current name and Ownership) for at least the past five (5) years and must have a minimum of twenty five (25) athletic fields still in use in the United States for a minimum of the last five (5) years.

2. The designated Supervisory Personnel on the project must be factory certified, in writing by the Turf Manufacturer, as competent in the installation of the same synthetic infill fiber grass system, including sewing seams and proper installation of the infill mixture.

3. The Factory Certified Supervisory Personnel shall be on site to certify the turf installation and Warranty compliance.

4. The Turf Contractor must provide competent workmen skilled in this specific type of synthetic grass installation. The installation crew / technicians shall have experience of at least three (3) fields in play with the same synthetic infill fiber grass system being used.

C. Prior to the beginning of the synthetic turf installation:

1. The installer of the synthetic turf shall inspect the stone drainage sub-base for tolerance to grade.

2. String line the entire field every five (5') feet to identify high and low spots. Assist the stone drainage blanket installer with correcting any deficiencies in a proper and timely manner.

3. The turf installer will review and confirm Owner provided project test results for stone drainage base compaction, planarity and permeability to be in compliance with project specifications as it relates to the synthetic turf warranty.

4. The turf installer will accept the stone drainage sub-base in writing and supply a "Certificate of Base Acceptance" for the Architects approval before turf installation can begin.

D. Shock Attenuation Evaluation (G-Max Testing):

1. Near the completion of the turf, hire a third party, independent testing agency to perform ten (10) in place G max tests in compliance with ASTM F1936 and F355A, in locations as directed by the Architect. If any test results exceeds **125**, modify the infill material ratios as necessary to achieve satisfactory results. Perform additional testing to verify the results as directed by the Architect.

2. Guarantee / Warranty: During the twelve (12) year guarantee period, the G max rating shall remain less than **165**. Hire a third party, independent testing agency to perform ten (10) in place G max tests, in locations as directed by the Owner, during the first, third, fifth, seventh, ninth and eleventh years. If any test results meet or exceed **165**, modify the infill material ratios as necessary to achieve

satisfactory results. Perform additional testing to verify the results as directed by the Owner. If the G max rating exceeds **165** after three (3) attempts to repair the high rating, the Turf Contractor and Turf Manufacturer shall fully replace the synthetic turf field within ninety (90) calendar days at no cost to the Owner.

E. Materials Quality:

1. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields used for full contact football. The materials as hereinafter specified, should be able to withstand full climatic exposure in the specific location of the field, be resistant to insect infestation, rot, fungus and mildew; it shall also withstand ultra-violet light and heat degradation, and shall have the basic non clogging characteristic of vertical flow through drainage allowing free movement of surface run-off vertically through the turf where such water may flow through the stone blanket and into the field perimeter drainage system.

2. The adhesive bonding and sewn seams of all system components shall provide a permanent, tight, secure, and hazard free athletic playing surface. All inlaid lines / markings / logos and sewn seams shall remain in place throughout the duration of the warranty period.

3. The installed synthetic turf system (turf and infill), for the life of the product, shall drain through a rate of not less than 20 inches +/- per hour.

4. Crumb Rubber Infill:

   a. Shall not contain more than 0.01% by weight liberated fiber in accordance with the Synthetic Turf Council.
   b. Shall not contain more that 0.1% by weight within a 100-gram sample of metal content in accordance with ASTM D5603-01.
   c. Provide testing of every one (1) supersacks of CRI for iron content per load (or 44 bags), in accordance with ASTM D5603-01, 7.3.2. This would average 5 bags per field.
   d. Crumb rubber infill material that does not meet the standards for ASTM D5603-01 and EN-71-3 shall be removed and replaced at no additional cost to the Owner.

5. Material that does not meet the standards shall be removed and replaced at no additional cost to the Owner.

6. Recycled crumb rubber infill (CRI) from other synthetic turf fields is NOT acceptable for use at this site.

1.6 PRE-INSTALLATION MEETING

A. Convene One (1) Week after receipt of Submittals identified in 1.4, A. above;

1. An interview shall take place at a time and date to be determined by the Architect at the District Office of North Syracuse CSD. Present at this meeting shall be the Architect, Landscape Architect, Owner's Representative(s), the Project Manager

and Site Superintendent for the Prime Contractor and the Project Manager and Project Foreman for the Turf Installer. The purpose of this meeting will be to review turf product and installation means and methods, to interview and ascertain the experience and competence of the Turf Installer, as well as, the onsite Project Foreman for this project and to review the project schedule. The basis of choosing this particular product shall be in part due to the results of this interview process. Contractor shall submit all required submittals before this meeting as described in 1.4, A. above.

B. Convene Two (2) Weeks Prior to Stone Drainage Blanket Completion:

1. A second meeting shall take place at a time and date to be determined by the Architect at the District Office of North Syracuse CSD. Present at this meeting shall be the Architect, Landscape Architect, Owner's Representative(s), and the Project Manager for the Prime Contractor. The purpose of this meeting shall be to review and confirm schedule. (with particular attention on the turf installation) and to confirm that the turf product has been ordered by way of notarized copies of the original confirmed Purchase Order and guaranteed delivery date.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in wrapped, neat, secure condition. Provide means to unload products from delivery trucks.

B. Store products under cover and elevated above grade. Turf and turf material left on bare ground is not acceptable to be used, and may be rejected by the Architect.

C. Protect all products and installation area from vandalism, theft, other construction, premature use, etc. until Owner acceptance and Architect sign off.

1.8 WARRANTY

A. The warranty coverage shall not be prorated nor place limits on the amount of the field’s annual usage.

B. The Turf Contractor and/ or Turf Manufacturer shall provide a twelve (12) year Warranty and supported by a prepaid third party insured eight (8) year warranty, from an A-rated domestic insurance carrier, which warrants the usability and playability of the artificial turf system for its intended uses. Letters of credit are not acceptable.

C. The Turf Contractor and/or Turf Manufacturer must verify that their onsite representative has inspected the installation and that the work conforms to the Turf Manufacturer's requirements.

D. The Warranty shall support that all designs, game markings, and layouts conform to all currently applicable National Federation State High School Association or NCAA rules and regulations, or league specific requirements, depending on application.

E. The Warranty must have the following minimum characteristics:

a. Provide full coverage for a minimum of twelve (12) years from the date of Substantial Completion.

b. The turf fabric shall not lose more than an average 2% per year and not be limited to the amount of annual usage.

c. Shall guarantee the availability of replacement material for the synthetic turf system installed for the life of the warranty, including items that are no longer serviceable to maintain a serviceable and playable surface.

d. The warranty shall be all encompassing of the turf system including, but not limited to, the fibers, backing, adhesives, infill, tape and logos.

e. The Warranty shall include general wear including lacrosse goal crease(s) and damage caused from UV degradation.

f. The Warranty shall specifically exclude vandalism, and acts of God beyond the control of the Owner or the manufacturer.

g. Covers defects in the installation and workmanship, and further warrant that the installation was done in accordance with both the Manufactures' recommendations and any written directives of the Manufacturer's onsite representative.

h. Shall NOT be limited to just the repair or replacement of affected areas. Shall include all necessary materials, labor, transportation, removals, and disposal costs to complete repairs or replacement.

i. The synthetic grass turf must maintain an ASTM F355A and ASTM F1936 G-max of between 125 and 165 for the life of the Warranty. Refer to 1.5, D. of this section.

j. Any repairs or service to the field requested by the Owner or the Owner's representative shall be addressed within seven (7) days from the date of written notification.

1.9 MAINTENANCE SERVICE

A. The Turf Contractor will train the Owner's facility maintenance staff in the use of the specified maintenance attachments and equipment to routinely groom, sweep and plow the field.

B. The Turf Contractor will provide the Owner's facility maintenance staff with a recommended maintenance schedule specific for the intended level of use, etc.

1.10 SUBSTITUTIONS

A. If a product is being submitted as a substitution to the specified product; then the Prime Contractor shall submit and request a product material substitution with his/her bid. The Prime Contractor shall at a minimum provide the following for review by the Architect and Owner:

1. All submittals as specified herein
2. Product comparison
3. Cost Information (including proposal of change in Contract Sum)
4. Contractor's certification that proposed substitution complies with requirements in the Contract Documents
5. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

PART 2 - PRODUCTS

2.1 SYNTHETIC TURF SYSTEM

A. The installed synthetic turf system shall have the following physical properties:

Property	Specification	ASTM
Product Weight:	80 oz/sy (+/- 2 oz)	D418/D5848
Pile Yarn Weight:	50 oz/sy	D418/D5848
Fiber Denier	12,200 (slit film and mono fibers combined)	D1577
Yarn Thickness:	100 microns (XP Blade), 350 microns (Mono)	D3218
Pile Height:	2 ¼" nominal	D418/D5848
Avg. Tuft Bind:	8+ lbs. (with infill)	D1335
Primary Backing:	7 oz/sy	D418/D5848
Secondary Backing:	22 oz/sy (urethane)	D418/D5848
Avg. Grab Tear (length)	>200 lbs./force	D5034
Avg. Grab Tear (width)	>300 lbs./force	D5034
Abrasiveness Index	<25	F1015
Permeability	>20 inches/hour	DIN 18-035-6
Pill Flammability	Pass	D2859
G Max (Impact)	< 125 at install, < 165 over life of field	F355A / F1936
HIC (Impact)	< 700 at install, < 1000 over life of field	F355E
Tufting Gauge	1/2"	
Stitch Rate	9 stitches per 3"	
Field Color	Field Green, Field Green / Lime Green	
Roll Width / Length	15'wide and up to 220' long	
Infill	2.7lbs/sf ambient ground rubber / 3lbs/sf sand	
Drainage	3/16" holes on staggered 4" centers	

B. Turf Carpet: shall consist of 100% polyethylene parallel-long slit fiber (TenCate XP Blade) and monofilament (TenCate Monoslide Ultra XQ, four-ply) blended in dual yarn types and dual yarn thicknesses tufted through the same stitch into a primary backing (TenCate XK Tuff Back) with a secondary backing consisting of a minimum of 22 ounces of urethane per square yard.

1. The Carpet shall be furnished in 15' wide rolls with four (4") inch white, football 5-yard lines tufted into each roll, when applicable. The perimeter white line shall also be tufted into the individual sideline rolls, when applicable. The rolls shall be of sufficient length to go from sideline to sidle line without splicing. Head seams, between the sidelines, will not be acceptable. All seams will be sewn

(glued seams are NOT acceptable) and thread for sewing shall be as recommended by the Turf Manufacturer.

2. The fiber shall be low friction, UV-resistant fiber measuring not less than 2 ¼ inches high. The same fiber from the above listed projects (Section 1.4, B.) must be used on this project.

3. All colored inlaid lines, sport markings, numbers, and logos shall be made of the same exact blended fiber material as specified for the field carpet and shall be cut in and glued or "inlaid" as recommended by the Turf Manufacturer.

C. Field Markings: All markings to be installed in accordance with the Owner / Architect approved shop drawings, NFHS, and ASBA standards.

1. Inlaid Lines: field lines to be inlaid into the turf:
   a. Baseball: All lines shall be inlaid white.
   b. Softball: All lines shall be inlaid black.
   c. Soccer: All lines shall be inlaid white.
   c. Men's Lacrosse: All lines shall be inlaid navy.
   d. Women's Lacrosse: All lines shall be inlaid lagoon blue.
   e. Field Hockey: All lines shall be inlaid silver.
   f. Logos, Text, and Graphics: will be inlaid according to color and artwork, submitted by the Owner / Architect to the Turf Contractor.

D. Resilient infill: The resilient infill materials shall be approved by the Manufacturer. The infill shall consist of a specially formulated mixture of approximately 2.7 lbs. per square foot of crumb rubber and 3 lbs. per square foot of sand engineered to provide the look, feel, footing, and shock absorption of a natural grass field in ideal conditions.

1. Ambient ground SBR Crumb Rubber: Granules shall contain minimal dust or contaminants and shall be derived from the ambient processing form of recycled tires. Color shall be substantially black and shall meet the 10 – 20, 8 – 16 or 8 – 14 mesh size designation.

   a. The clean, uniformly sized particles shall be consistent in shape and particle size distribution.
   b. The particles shall resist abrasion in high traffic and excessive wear applications and provide stability to artificial sports turf applications.
   c. The particles shall be processed and sized under rigid specifications and Manufacturers' statistical and quality control assurance program.
   d. Particles shall be structurally pure and consistently uniform in size distribution for predictable performance.

2. SBR Crumb Rubber Certification: The Turf Contractor / Turf Manufacturer shall provide in writing that they maintain an ongoing Quality Control program meeting all the standards of the STC Guidelines for CRI Used in Synthetic Turf Fields and capable of meeting all specifications described herein.

   a. Turf Contractor shall supply the Architect with a copy of the Crumb Rubber Infill (CRI) Shipment / Order Certification that includes, type and origin of raw material (certify that it comes from tires), production

facility, production method, fiber content (%), and (CRI) sieve / gradation analysis.

b. The SBR rubber infill provided for this project shall comply with the Synthetic Turf Council's recommended testing guidelines for infill based on the EN 71-3 standard for children's toys or come from a source that maintains an active Environmental Labs (UL) Environmental Claim Validation Summary showing that the rubber produced actively meets the EN 71 standard and CPSIA standard for lead. Provide written document stipulating the above.

3. Sand Particulate: The sand provided as a component of the infill mixture shall be rounded so as to minimize abrasion to the athlete and synthetic grass fibers. Supplied from either Unimin or US Silica or Architect approved equal. Sand infill shall comply with the following characteristics:

a. Average particle size between 20 and 30 mesh (calculated based on summing the midpoint of sieve pan fractions times the % retained on given screen fractions)

b. Average particle shape > 0.4 on the Krumbein scale

c. Particle structure predominantly single grain.

d. Produce <0.4%, -50M in API crush test at 80 psig.

E. Inlaying Materials:

1. Adhesive for inlaying lines and markings shall be a two-component fast set urethane adhesive obtained from a single manufacturer and be equivalent to Ultrabond Turf PU 2K as manufactured by Mapei Corporation (800)-992-6273, or one-part moisture-cured polyurethane obtained from a single manufacturer and be equivalent to 34-G as manufactured by Synthetic Surfaces, Inc. (908)-233-6803 or Architect approved equal.

2. Seaming Tape: Tape for securing inlaid lines shall be high quality tape made with a minimum roll width of twelve inches (12”).

F. Alternating Field Panels: Field color shall be dual color alternating panels with blended fibers of field green/lime green and field green/olive green. Other marking colors shall be as noted in 3.4.

G. Standard of Quality shall be: **A-Turf Titan DiamondBlade-RS** synthetic turf system as manufactured by: A-Turf, Inc., Williamsville, NY 14231, www.aturf.com, Contact: Rick Krysztof, (888)-777-6910; or **Field Turf Vertex Prime (FTVTP-1)** synthetic turf system as manufactured by: FieldTurf Internation, Inc, Dalton, GA 30721, www.fieldturf.com, Contact: Chris White, (607)-729-8500; or Architect approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The installation shall be performed in full compliance with approved Shop Drawings and Submittals.

B. Only trained technicians, skilled in the installation of outdoor athletic caliber synthetic turf systems working under the direct supervision of the Factory Certified Installation Supervisors, shall undertake any cutting, sewing, gluing, top-dressing or brushing operations.

C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the infill mixture.

D. All designs, markings, layouts, and materials shall conform to all currently applicable NFHS rules and/or other rules or standard that may apply to this type of synthetic grass installation. All designs, markings and layouts must first be approved by the Architect and Owner in the form of an approved shop drawings. All markings will be installed in full compliance with those drawings.

3.2 EXAMINATION

A. Verify that all stone drainage sub-base leveling is complete prior to installation.

B. The surface to receive the synthetic turf shall be inspected by the Turf Contractor, and prior to the beginning of installation, the Turf Installer must accept the sub-base planarity in writing. The surface must be perfectly clean as installation commences and planarity shall be maintained to a surface tolerance that does not exceed 0"-1/4" over 10 feet and 0"-1/4" from design grade throughout the installation process by the Turf Contractor.

3.3 TURF INSTALLATION

A. Install in accordance with Manufacturer's instructions. The Turf Contractor shall strictly adhere to the installation procedures outlined under this section. Any variance from these requirements must be accepted in writing, by the Manufacturer's onsite representative, and submitted to the Architect/Owner, verifying that the changes do not in any way affect the warranty or performance of the system. Infill materials shall be approved by the Manufacturer and installed in accordance with the Manufacturer's standard procedures.

B. The carpet rolls are to be installed directly over the properly prepared stone drainage blanket or resilient pad, if applicable. Rolls shall be laid out flat a minimum of four (4) hours prior to starting seaming procedures and allowed to relax / expand. Extreme care should be taken to avoid disturbing the stone blanket or pad, both in regard to compaction and planarity. Provide a 2-5 ton static roller onsite to repair and properly stabilize any disturbed areas of the stone blanket.

C. The full width rolls shall be laid out across the field. Turf shall be sufficient length to permit full cross-field installation from sideline to sideline. No "head" or cross seams will be allowed in the main playing area between sidelines. Utilizing standard state of the art sewing procedures each roll shall be attached to the next. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing field turf.

D. All seams shall be sewn using double bagger stitches and polyester thread (per the manufacturer's standard sewing procedures). Seams shall be flat, tight and permanent with no separation or fraying, for the life of the carpet.

E. Infill materials shall be applied in numerous thin lifts. The turf shall be brushed as the mixture is applied. The infill material shall be installed to a depth determined by the Manufacturer or 1.5 inches within the fiber matrix. The mix shall be uniform and an even thickness to assure proper playing characteristics.

F. All equipment used for spreading of infill shall be fitted with a magnetic tow bar, so that as CRI is being installed, metallic impurities will be collected. If spreading equipment cannot be fitted with a magnetic tow bar, the contractor shall follow each pass of the spreading machine with a magnetic tow bar equipped on separate equipment to collect metallic impurities as the infill is being installed.

G. The infill materials shall be installed to fill the voids between the fibers and allow the fibers to remain vertical. Specifically formulated rubber and sand infill shall be installed in accordance with manufactures system recommendations.

H. Synthetic turf shall be attached to the perimeter edge detail in accordance with the Manufacturer's standard procedures and as detailed.

I. Inlaid markings that are not tufted into the system shall be cut in and glued in accordance with synthetic turf contractors approved seaming methods for "inlaid" game markings.

J. Prior to field acceptance, the turf shall be groomed by means of a nylon rotary brush to provide the look, feel and safety of optimally maintained natural grass, including subtle undulation normally associated with natural grass athletic fields as reviewed and approved by the Architect. The field shall have a magnetic tow bar run over the final surface one last time prior to the final grooming.

K. The Turf Contractor shall leave the Owner two (2) full spare bags of crumb rubber/sand blend to use in topdressing the fields. Leave in a location as approved by the Owner.

3.4 CLEAN UP

A. Contractor shall provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items to the satisfaction of the Architect / Owner.

B. All usable remnants of new material shall be neatly rolled up and turned over to the Owner at a place and area designated by the Owner.

C. During the contract and at intervals as directed by the Architect and as synthetic turf installation is completed, clear the site of all extraneous materials, rubbish, or debris and leave the site in a clean, safe, well draining, neat condition.

D. Surfaces, recesses, enclosures, etc., shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

END OF SECTION 321800

SECTION 323001 – ATHLETIC EQUIPMENT AND FURNISHINGS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of athletic equipment and furnishings is shown on the drawings and as specified in the contract documents.

B. Athletic equipment and furnishings work includes, but is not limited to, the following:

1. Providing, installing, and turning over select athletic equipment and furnishings as noted in the specifications and as detailed.
2. Instruction of Owner’s Designated Representative
3. Cleanup

C. Provide all labor, materials, tools and equipment necessary to install athletic equipment and furnishings as indicated on the plans and as specified.

D. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instructions and in accordance with all approved shop drawings and submittals.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 – Site Earthwork

B. Section 321301 – Site Concrete Work

1.3 REFERENCES

A. National Federation of State High School Associations (NFHS)

B. American Sport Builders Association (ASBA)

C. Manufacturers Data and Recommended Installation Requirements

1.4 SUBMITTALS (See Section 311201, 1.5)

A. Provide Manufacturer's Product Data (MPD), Material Certificate and samples as noted:

1. Single Tier Aluminum Team Benches: MPD and Color Sample
2. Communication Boxes: MPD
3. Bases and Pitcher’s Rubber (w/ Ground Anchors): MPD
4. Portable Turf Bases, Home Plates, and Pitching Rubbers (w/out Ground Anchors): MPD
5. Home Plate Synthetic Turf Forming System and Cover Plug: MPD
6. Base Anchor Access Frame w/ Infill Retainer System: MPD
7. Dual Anchor Access Frame w/ Infill Retainer System: MPD
8. Foul Poles: MPD
9. Baseball Overhead Tension Single Batting Tunnel: MPD

10. Soccer Goal System: MPD
11. Lacrosse Goals: MPD
12. Field Hockey Goals: MPD
13. Chain Link Fence Backstop Padding and Accessories: MPD
14. Corner Flags: MPD
15. Stand Alone Bat Rack: MPD and Color Sample
16. Spiked Softball Pitching Mat: MPD and Color Sample
17. Practice Baseball Mound: MPD
18. Team Benches: MPD and Color Sample

1.5 JOB CONDITIONS

A. All job conditions in Specification Section 312201 apply.

1.6 QUALITY ASSURANCE

A. Manufacturer's warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

B. Installer Experience Requirements:

1. Submit business name, business owner(s) name(s), business address, telephone number, website and/or email address signed by the Contractor/Subcontractor who meets the qualifications set forth in this specification and is proposed by the Contractor to perform the installation of the Athletic Equipment and Furnishings.

2. Provide a list of at least five (5) work projects of comparable size, scope and quality completed successfully by the proposed Contractor/Subcontractor within the past three (3) years that includes the date completed, project Owner's name and current contact information, including telephone numbers and email addresses.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in wrapped, neat, secure condition. Provide means to unload products from delivery trucks.

B. Protect all products and installation area from vandalism, theft, other construction, premature use, etc. until Owner acceptance and Architect sign off.

C. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately reordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

1.8 SUBSTITUTIONS

A. If a product is being submitted as a substitution to the specified product; then the Prime Contractor shall submit and request a product material substitution with his/her bid. The

Prime Contractor shall at a minimum provide the following for review by the Architect and Owner:

1. All submittals as specified herein
2. Product comparison
3. Cost Information (including proposal of change in Contract Sum)
4. Contractor's certification that proposed substitution complies with requirements in the Contract Documents
5. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2.0 PART 2 - PRODUCTS

2.1 TEAM BENCHES

A. 15' Standard Expanded Bench with Back (Portable Mount) (Alternate LC-01)

1. Shall be 15' long. Tubular legs and understructure parts made from galvanized steel finished with black polyester powder coating. Seat and back rest shall be 2" in thickness and coated in a copolymer-based thermoplastic powder coating . Thermoplastic is applied at a thickness of 25-30 mils. 9-gauge expanded steel construction.
2. Measurements: Bench 180"L x 22.5"W x 31"H, Legs 21"W x 2.5" thick, Seat 12"D x 14"H
3. Six (6) units required.
4. Finish selected by Owner. Provide color chart of all available options.
5. Basis of design and standard of quality shall be Jordan Park Bench, Model B15WBP as manufactured by Commercial Site Furnishings, 800-278-4480, or Architect approved equal.

B. 4' Standard Expanded Bench with Back (Portable Mount) (Base Bid)

1. Shall be 4' long. Tubular legs and understructure parts made from galvanized steel finished with black polyester powder coating. Seat and back rest shall be 2" in thickness and coated in a copolymer-based thermoplastic powder coating . Thermoplastic is applied at a thickness of 25-30 mils. 9-gauge expanded steel construction.
2. Measurements: Bench 48"L x 22.5"W x 31"H, Legs 21"W x 2.5" thick, Seat 12"D x 14"H
3. Three (3) units required.
4. Finish selected by Owner. Provide color chart of all available options.
5. Basis of design and standard of quality shall be Jordan Park Bench, Model B4WBP as manufactured by Commercial Site Furnishings, 800-278-4480, or Architect approved equal.

C. 10' Two-Tier Pre-assembled Aluminum & Polyboard Team Benches (Base Bid)

1. A. Overall Dimension: 10' long. Seating height and depth satisfies all applicable ADA requirements. Provide two (2) benches per dugout.

2. Frame constructed from 2.0in x 2.0in x .125in square aluminum tubing and 1/8" aluminum formed steel frame.

3. Pre-fabricated planking from proprietary 2" x 4" or 2" x 6" polyboard planks. Polyboard planks made from 90% recycled post consumer plastic.

4. All structural connections welded and powder-coated using color selection by Owner based on available options from manufacturer.

5. Polyboard plank color selected by Owner based on available options.

6. Galvanized anchoring & stainless steel assembly hardware included.

7. Standard of quality shall be Two-Tier Polyboard Bench, G-TTPY-10 as manufactured by:

Sportsfield Specialties Inc.
P.O. Box 231
41155 State Highway 10
Delhi, NY 13753
p. 888-975-3343
f. 607-746-8481
www.sportsfieldspecialties.com

Or Architect approved equal.

2.2 COMMUNICATION BOXES

For Use in Synthetic Turf:

A. Shall be 18"W x 30"L x 14"H constructed of 3/16" aluminum, for synthetic turf installation. Cover is made of 1/8" aluminum (plywood unacceptable) and includes flexible gasket seals to prevent infill migration. Cover shall be recessed to accept synthetic infill turf. Shall have two (2) 10-1/8" diameter hand holes with circular lids; lids to have "turn and lock" feature.

B. Basis of design and standard of quality shall be model CBIT1830 ComBox® as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

C. Provide three (3).

2.3 BASES AND PITCHER'S RUBBER (w/ Ground Anchors)

A. Bases: Heavy duty, molded rubber construction, chevron design allowing base to compress upon impact. Complete set of 3 bases including 1 ½" anchor and rubber plugs, compatible with synthetic turf systems. For the softball field provide double first base with orange side for runner. Standard of Quality shall be Schutt Original Jack Corbett Hollywood Base Sets and Hollywood Impact Double First Bases as manufactured by

Beacon Ball Fields (800) 747-5985 or Architect approved equal. Provide one (1) set of baseball field bases and one (1) set of softball field bases.

B. Pitcher's Rubber: Shall be re-moveable, 6" x 24" white rubber with double 1-1/2" ground anchor and two (2) plugs. Standard of Quality shall be Deluxe Double Stanchion as manufactured by Beacon Ball Fields or Architect approved equal. Quantity shall be eight (8).

2.4 PORTABLE TURF BASES, HOME PLATES, AND PITCHING RUBBERS (w/out Ground Anchors)

A. Home Plate: Shall be five-sided, durable all rubber mesh reinforced construction, design specifically for synthetic turf applications requiring no ground anchors. Molded pegs 1" height max. for gripping into turf and infill material and preventing lateral movement. Quantity shall be five (5) total. Standard of Quality shall be TurfBase Home Plate, TBHP as manufacturered by: Sportsfield Specialties Inc. P.O. Box 231, 41155 State Highway 10, Delhi, NY 13753. p. 888-975-3343, f. 607-746-8481; or Architect approved equal.

B. Pitcher's Rubber: Shall be 6" x 24" white, durable all rubber mesh reinforced construction, design specifically for synthetic turf applications requiring no ground anchors. Molded pegs 1" height max. for gripping into turf and infill material and preventing lateral movement. Quantity shall be eight (8) total. Standard of Quality shall be TurfBase Pitching Rubber, TBPR as manufacturered by: Sportsfield Specialties Inc. P.O. Box 231, 41155 State Highway 10, Delhi, NY 13753. p. 888-975-3343, f. 607-746-8481; or Architect approved equal.

C. Base Set: Shall be 15"x15"x3" white, durable all rubber mesh reinforced construction, design specifically for synthetic turf applications requiring no ground anchors. Molded pegs 1" height max. for gripping into turf and infill material and preventing lateral movement. Quantity shall be one (1) set total for baseball. Standard of Quality shall be TurfBase Set, TBS as manufacturered by: Sportsfield Specialties Inc. P.O. Box 231, 41155 State Highway 10, Delhi, NY 13753. p. 888-975-3343, f. 607-746-8481; or Architect approved equal.

D. Double First Base Set: Shall be three (3) 15"x15"x3" white and one (1) 15"x15"x3" safety orange. Bases shall be durable all rubber mesh reinforced construction, design specifically for synthetic turf applications requiring no ground anchors. Molded pegs 1" height max. for gripping into turf and infill material and preventing lateral movement. Quantity shall be one (1) set total. Standard of Quality shall be TurfBase Double First Base Set, TBDS as manufacturered by: Sportsfield Specialties Inc. P.O. Box 231, 41155 State Highway 10, Delhi, NY 13753. p. 888-975-3343, f. 607-746-8481; or Architect approved equal.

2.5 HOME PLATE SYNTHETIC TURF FORMING SYSTEM AND COVER PLUG

A. COMPONENTS:

1. Home Plate Forming System:
   a. Measures 2'-8"L x 2'-8"W x 5"H
   b. Welded Construction, Fabricated of 1/8" Aluminum Sheet with One (1) ½" Sch. 40 Aluminum Drainage Pipe and Five (5) ¾" Aluminum Round

Stock Threaded Studs with 3/8" Stainless Steel Bolts for Home Plate Tray Height Adjustment

c. Removable and Height Adjustable Home Plate Tray, Fabricated of 1/8" Aluminum Sheet
d. Includes Replaceable SHSRHP Schutt®® Hollywood Bury All Home Plate
e. Includes Synthetic Infill Turf Attachment Ledge
f. HPFSCP Removable Cover Plug: 1/8" (0.125") Aluminum Sheet with 1.5" Square Aluminum Support Structure, Synthetic Turf Provided By and Installed By Others

B. Quantity shall be five (5). To be installed at baseball and softball home plate at field, and the three bullpen/batting tunnel locations.

C. Standard of quality shall be HPFS-Home Plate Forming System as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.6 BASE ANCHOR ACCESS FRAME W/ INFILL RETAINER SYSTEM

A. Components:

1. Schutt/Hollywood Anchor Access Frame for Infill Turf:
   a. Dimensions: 8-1/16"W x 8-1/16"L x 10"H
   b. Box: 1/8" (0.125") Aluminum Construction, Welded Frame with Open Bottom Having the Following Attributes:
      i. 1/8" (0.125") Aluminum Construction
      ii. Integrated Synthetic Infill Turf Attachment Ledge
      iii. Infill Retainer System with 1-1/4" (1.25") Flexible Gasket Seals Specifically Designed for Synthetic Infill Turf Applications
      iv. Anchor Base, Anchor Bolts and Anchor Spacer
      v. 1" PVC Drain Stub for Positive Drainage Connection
   c. Solid Cover: 1/8" (0.125") Aluminum Construction with the Following Attributes:
      i. Infill Retainer System with 1-1/4" (1.25") Flexible Gasket Seals Specifically Designed for Synthetic Infill Turf Applications
      ii. Designed to Allow Synthetic Turf Material to be Adhered Directly to the Aluminum Surface with Appropriate Adhesive and/or Mechanical Fasteners as Determined by Synthetic Turf Manufacturer
   d. Assembly Hardware

B. Standard of quality shall be SHAFIT – Schutt/Hollywood Anchor Access Frame for Infill Turf as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.7 DUAL ANCHOR ACCESS FRAME FOR WITH INFILL RETAINER SYSTEM

A. Components:

1. SHAFPRIT- Schutt/Hollywood Dual Anchor Access Frame for Infill Turf:
   a. Dimensions: 6-1/16”W x 22-15/16”L x 10”H
   b. Box: 1/8" (0.125”) Aluminum Construction, Welded Frame with Open Bottom Having the Following Attributes:
      i. 1/8" (0.125”) Aluminum Construction
      ii. Integrated Synthetic Infill Turf Attachment Ledge
      iii. Infill Retainer System with 1-1/4” (1.25”) Flexible Gasket Seals Specifically Designed for Synthetic Infill Turf Applications
      iv. Dual Anchor Base, Anchor Bolts and Anchor Spacers
      v. 1” PVC Drain Stub for Positive Drainage Connection
   c. Solid Cover: 1/8" (0.125”) Aluminum Construction with the Following Attributes:
      i. Infill Retainer System with 1-1/4” (1.25”) Flexible Gasket Seals Specifically Designed for Synthetic Infill Turf Applications
      ii. Designed to Allow Synthetic Turf Material to be Adhered Directly to the Aluminum Surface with Appropriate Adhesive and/or Mechanical Fasteners as Determined by Synthetic Turf Manufacturer
   d. Assembly Hardware

B. Standard of quality shall be SHAFPRIT – Schutt/Hollywood Dual Anchor Access Frame for Infill Turf as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.8 FOUL POLES

A. Components:

1. Foul Pole Fabricated with 6" Schedule 40 Aluminum Pipe (6.625" O.D.):
   a. 20.0 ft Above Ground Height
   b. Powder Coated Yellow

2. LGFPGS Foul Pole Ground Sleeve Fabricated with 6.30in OD (6.10in ID) Aluminum Pipe:
   a. 4.0 ft Length
   b. Aluminum Mill Finish
   c. Aluminum Ground Sleeve Caps

3. Angled Wing Fabricated of .125in Aluminum:
   a. Stamped Mesh, 1.50in x 1.50in Punchouts
   b. 18.0in Wide x 12.0ft Long
   c. Double Reinforced Bends, Welded at Corners
   d. Powder Coated Yellow

4. Accessories:
   a. Stainless Steel Assembly Bolts and Nuts

B. Standard of quality shall be LGFPW630 - 30ft Foul Pole with Wing, provide two (2), as manufactured by:

Sportsfield Specialties Inc.
P.O. Box 231
41155 State Highway 10
Delhi, NY 13753
p. 888-975-3343
f. 607-746-8481

or Architect approved equal.

2.9 BASEBALL OVERHEAD TENSION SINGLE BATTING TUNNEL – (PROVIDE 3)

A. Basis of design and standard of quality shall be as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

B. Provide three (3) tunnels.

C. COMPONENTS:

1. BTTBS Tension Batting Tunnel; Single:
   a. Four (4) Upright Poles Fabricated of 8" Schedule 40 Steel (8.625" O.D.) Pipe
      1. 4' Direct Embedment or Optional Ground Sleeve
   b. Fixed Net Stabilizer Extension Arms Fabricated of 3/8" Steel Plate x 18"L
   c. Crossbar Supports Fabricated of 4" x 3/16" Wall Square Steel Tube
   d. Super Durable Black Powder Coated Finish
      1. Enhanced Resistance to UV
   e. Tension Cable Support: ¼" 7x19 Black Powder Coated Galvanized Aircraft Cable with ½" x 6" Jaw and Jaw Turnbuckles
   f. One (1) 13'H x 14'W x 75'L Baseball Net
      1. #36 Black Nylon 1-3/4" Square Mesh Net
         a. #36 Twisted Knotted Netting
         b. 100% Nylon Construction
         c. 2.6mm (0.1023") Diameter Twine
         d. 87% Open Mesh Area (See-Through Visibility)
         e. 13,363 psi Minimum Breaking Strength
         f. 1-3/4" (44mm) Maximum Square Mesh Size
         g. 0.0425 lbs. per Square Foot
         h. Black Multi-Filament Polypropylene Solid Braid Derby Rope Sewn Binding on Perimeter Edges – ¼" Diameter, 530 lb. Minimum Breaking Strength
         i. UV and Weather Treated
      2. Two (2) 4'W x Full Height Openings with Curtain Style Exterior Overlap Flaps
      3. Lead Line Bottom Deadweights
         a. Factory-Sewn / Integrated into Batting Tunnel
         b. Samson Rope Dura Oceanmaster Lead Line®
         c. Flexible / Easy to Handle
         d. Surface Yarns on Cover Designed to Lash to Netting
         e. 2,000 lbs. Average Strength
         f. 250 lbs. per 100 Fathoms Material Weight (0.42 lbs/ft)
   g. Model Specific Hardware Kit and Installation Instructions

2. Concrete shall be 4,000 psi as described in Section 321301.

2.10 SOCCER GOAL SYSTEM

A. Basis of design and standard of quality shall be SG824R as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

B. Provide one (1) pair round face soccer goals.

C. Components:

1. SG824R Round Post Soccer Goal(s):

a. Cross Bar: #4950-TOPCROSSBAR Fabricated of 6061 T6 extruded aluminum tube, 4.375" x 4.688", having the following attributes:
1. Length: 24' (inside of upright to inside of upright)
2. Round face with radiused backside corners
3. 7 gauge powder coated steel crossbar attachment brackets
4. Powder coated white

b. End Frame: #4950-ENDFRAME fabricated of 6061 extruded aluminum tube having the following attributes:
1. Upright posts, 4.375" x 4.688", round face with radiused backside corners
2. Rolled side frame, 2" x 3" x .1/8" wall thickness, tig welded to upright posts
3. Powder coated white

c. Ground Bar: #4950-BOTTOMGROUNDBAR fabricated of 6061 T6 extruded aluminum tube, 2" square x .1/4" wall thickness, having the following attributes:
1. Powder coated white

d. Accessories:
1. Welded aluminum net clips, guaranteed for life
2. Soccer Net: 5mm braided polyethylene, 4" square mesh, white
3. Ground stake storage compartment.
4. Stainless steel assembly hardware

2. SGMKR SGMobile - Soccer Goal Portable Wheel Mobility Kit:

a. Soccer Goal Wheel Insert
1. Welded 13 gauge stainless steel frame
2. UHMW plastic wheel
3. Stainless steel hardware

b. Soccer Goal Mobility Handle
1. Formed 3/8" stainless steel round stock
2. Stainless steel hardware
3. Powder coated white.

3. SG2SNG - Soccer Goal Back Bar Safety Clamp Kit for Grass Fields (provide 2):

a. #SG2S-NG Safety Clamp

1. Fabricated of ¼" aluminum
2. Powder coated white
3. Quick release hardware
4. For use with Access Kit
5. Access Frame and Cover fabricated of 1/8" aluminum with gasket seal and 1" pvc drain stub.
6. 13 gauge stainless steel pivot bar.
7. Galvanize Steel Anchoring Hardware

4. Concrete shall be 4,000 psi as described in Section 321301.

2.11 LACROSSE GOALS

A. Goals: Shall be heavy duty 1.9" inch powder coated steel pipe posts and cross bar, 4" flat base bar, 2 piece construction. Standard of quality shall be Professional Game Goal as manufactured by Brine or Architect approved equal.

B. Provide two (2) goals.

C. Nets shall be 4.0mm high extension polyester lacrosse net, 6' x 6' x 7' official size. Color as selected by the owner. Triple stitched bindings with quick fasteners and lacing cord. Standard of quality shall be Championship Lacrosse Net as manufactured by Brine or Architect approved equal.

2.12 FIELD HOCKEY GOALS

A. Frame: Shall be fabricated of 2" x 2" x 0.090" wall square aluminum tubing, tig welded. Aluminum welded net clips. Powder coat finish white.

B. Backboard shall be made of marine grade plywood.

C. Accessories: Black nylon net, stainless steel assembly hardware and field hockey goal wheel kit.

D. Provide two (2) goals.

E. Standard of quality shall be FHG Field Hockey Goal and FHGWK Field Hockey Goal Wheel Kit as manufactured by Sportsfield Specialties, Inc., 888-975-3343 or Architect approved equal.

2.13 CHAIN LINK FENCE BACKSTOP PADDING AND ACCESSORIES:

A. Shall be installed along baseball backstop only.

B. Basis of design and standard of quality shall be model BFWPCL46 BaseZone® Field Wall Padding and Accessories as Manufactured and/or Supplied by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

C. COMPONENTS:

1. BaseZone® Field Wall Padding:

a. Outdoor Vinyl Encasement:
    i. High UV Resistance
    ii. Total Weight: 18 oz./yd^2 (ASTM D3776)
    iii. Construction: 84% Vinyl Coating, 16% Polyester Fabric (ASTM D751)
    iv. Tongue Tear: Warp 93 lbs., Fill 68 lbs. (ASTM D751)
    v. Grab Tensile: Warp 232 lbs., Fill 213 lbs. (ASTM D751)
    vi. Adhesion: Warp 28 lbs/in, Fill 40 lbs/in (ASTM D751)
    vii. Abrasion: > 1000 Cycles (ASTM D3389-94)
    viii. Cold Crack: -49° F (ASTM D2136)
    ix. Rot, Mildew and Fungus Resistant: Yes
    x. Flame Resistance: None
    xi. Various Standard Colors Available
b. 3" Thick High Impact 1580 Polyurethane Foam
    i. Density: 1.45 – 1.55 pcf (ASTM D3574)
    ii. Impression Load Deflection (4" x 25" x 25" Sample)
        1. 25%: 75 – 85 (ASTM D3574)
        2. 65%: 128 – 145 (ASTM D3574)
        3. Support Factor 65/25: 1.7 min (ASTM D3574)
    iii. Resilience (% Rebound): 40 – 48 (ASTM D3574)
    iv. Tear Resistance: 1.5 – 2.5 lbs/in (ASTM D3574)
    v. Static Fatigue:
        1. % Loss @ 25% ILD: Less than 35 (ASTM D3574)
        2. % Loss in Thickness: Less than 10 (ASTM D3574)
    vi. Flammability: Passes with Class 1 Fabric (California TB 117-2013)
c. 3/4" Square Edge AdvanTech® Water Resistant Sheathing Panel; All Sides Stained and Sealed with Exterior Grade Finish
d. Stainless Steel Staples and Applicable Hardware
e. Wall Mounting Hardware:
    i. Bolt and Back-up Plate Chain Link Fence Attachment Hardware
f. Impact Testing; Independently Certified:
    i. ASTM F2440; 10 lb. x 6.3" Dia. Hemisphere Head Form, 4' Drop Height (Impact Velocity: 10.9 MPH):
        1. G-max: 47
        2. Head Injury Criterion (HIC): 103
    ii. Head Injury Criterion (HIC) Impact Test: 10 lb. x 6.3" Dia. Hemisphere Head Form, 5' Drop Height (Impact Velocity: 12.2 MPH):
        1. G-max: 92
        2. Head Injury Criterion (HIC): 208
    iii. Head Injury Criterion (HIC) Impact Test: 10 lb. x 6.3" Dia. Hemisphere Head Form, 5'-6" Drop Height (Impact Velocity: 12.8 MPH):
        1. G-max: 244 (Failure)
        2. Head Injury Criterion (HIC): 905
g. 1-Year Manufacturer's Limited Product Warranty
h. Custom High-Resolution Digitally Printed Graphics

2.14 CORNER FLAGS

A. Shall be a hollow plastic base, 1" diameter PVC upright, with red triangular flag; Overall height of 60". Yellow hollow base to be weighted with sand on site.

B. Provide two (2) sets of four (4).

C. Basis of design and standard of quality shall be model SG6B1104 as distributed by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.15 STAND ALONE BAT RACK

A. Components: SUABRPL8 Stand Along Bat Rack Unit

1. Pre-Assembled Bat Rack Unit
   a. Constructed of Heavy Duty 1/8" (.125") Aluminum
   b. 20" Tall x 34-3/8" Wide
   c. Includes 8 Equal Sized Storage tubes for Bat Storage
   d. Support structure, including hardware and fasteners, for concrete footing installation.
   e. Powder Coated Finish, Colors Selected By Owner

B. Quantity shall be three (3).

C. Basis of design and standard of quality shall be as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.16 SPIKED SOFTBALL PITCHING MAT

A. Shall be a removable spiked game mat with minimum 7,000 spikes. Designed to protect synthetic turf fields. Regulation size for high school and college softball: 11'L x 4'W. Lane stripes included.

B. Color shall be as selected by Owner. Provide turf color sample.

C. Quantity shall be four (4).

D. Standard of quality shall be Paisley's Pro Spiked Game Mat as manufactured by Portolite (877-943-5960) or Architect approved equal.

2.17 PRACTICE BASEBALL MOUND

A. Components:

1. Porta-Pitch Bullpen Mound:
   a. Welded Construction, Fabricated of Aluminum Plate, Structural Members and 1/8" (0.125") Thick Aluminum Panel Factory Covered with a 6mm Rubber Shock Absorption Impact Pad and Green Colored Synthetic Turf with Thatch Layer Securely Attached with NORDOT® Urethane Adhesive #34G
   b. Size: 6'-4"W x 13'-6"L
   c. Tapered Height of 10" Above Finish Grade and Sloped 1" Vertical Per 1' Horizontal

d. Four (4) Modular Pitching Mound Sections Designed to Rest on the Athletic Surface, No Ground Anchors Required
e. Center Section Includes Hilltopper® Polymer Enhanced Mound Clay with Flexible Gasket Seal Perimeter, One (1) Regulation Size 6”W x 24”L Professional Four (4) Sided Removable and Replaceable Pitching Rubber
f. Detachable External Wheel System with Lifting Jack and Powder Coated Steel Tow Hitch for Portability and Transport Purposes
g. Designed to be Set-up or Removed in +/- 20 Minutes with Three (3) Trained Adults

B. Quantity shall be three (3).

C. Standard of quality shall be Porti-Pitch Pitcher’s Bull Pen Mound Model LGPRTPTCH-GR-BP as manufactured by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

PART 3 EXECUTION

3.1 TEAM BENCHES

A. Assemble per manufacturer’s instructions and turn over to Owner in location as directed.

3.2 COMMUNICATION BOXES

A. Site Contractor shall install per drawings and manufacturer’s recommendations. The Site Contractor shall provide complete excavation, trenching, conduit, pull strings, bedding, backfill, and compaction. Electrical Contractor shall provide any wiring.

3.3 BASES AND PITCHER’S RUBBER

A. Install as recommended by the manufacturer.

3.4 PORTABLE TURF BASES, HOME PLATES, AND PITCHING RUBBERS

A. Turn over to Owner as directed by the Architect.

3.5 HOME PLATE SYNTHETIC TURF FORMING SYSTEM AND COVER PLUG

A. Install as recommended by the manufacturer.

3.6 BASE ANCHOR ACCESS FRAME W/ INFILL RETAINER SYSTEM

A. Install as recommended by the manufacturer.

3.7 DUAL ANCHOR ACCESS FRAME W/ INFILL RETAINER SYSTEM

A. Install as recommended by the manufacturer.

3.8 FOUL POLES

A. Install in areas as shown on the plans and details per manufacturer's recommendations. Review layout with Architect prior to installation.

3.9 BASEBALL OVERHEAD TENSION SINGLE BATTING TUNNEL

A. Install as recommended by the manufacturer and as detailed.

3.10 SOCCER GOAL SYSTEM

A. Install clamp kit as shown on the plans and details per manufacturer's recommendations.

B. Assemble goals per manufacturer's instructions and turn over to Owner in a location as directed.

3.11 LACROSSE GOALS

A. Assemble per manufacturer's instructions and turn over to Owner in location as directed.

3.12 FIELD HOCKEY GOALS

A. Assemble per manufacturer's instructions and turn over to Owner in location as directed.

3.13 CHAIN LINK FENCE BACKSTOP PADDING AND ACCESSORIES

A. Install as shown on the plans per manufacturer's recommendations and instructions.

3.14 CORNER FLAGS

A. Turn over to Owner as directed by the Architect.

3.15 STAND ALONE BAT RACK

A. Install permanently as recommended by the manufacturer within synthetic turf.

3.16 SPIKED SOFTBALL PITCHING MAT

A. Turn over to Owner as directed by the Architect.

3.17 PRACTICE BASEBALL MOUND

A. Assemble per manufacturer's instructions and turn over to Owner in location as directed.

3.18 INSTRUCTION OF OWNER'S DESIGNATED REPRESENTATIVE

A. After installation and prior to final acceptance of the Project, provide an instruction period for the Owner's designated representative. Instruction shall be sufficient to cover the contents of the equipment operations and maintenance requirements, a walk-through of the project, and a review of all warranties

3.19 CLEAN UP

A. During the contract and at intervals as required by the contract documents and as directed by the Architect and as field event furnishings are installed, clear the site of all extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well-draining, neat condition.

END OF SECTION 323001

SECTION 323002 - METAL BOLLARDS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of metal bollards is shown on the drawings and as specified in the contract documents.

B. Metal bollards work includes, but is not limited to, the following:

1. Providing and installing metal bollards and furnishings as noted in the specifications and as detailed.
2. Cleanup

C. Provide all labor, materials, tools, equipment, and services required to install metal bollards and furnishings as indicated on the plans and as specified.

D. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instruction and in accordance with all approved shop drawings and submittals.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321301 - Site Concrete Work

1.3 REFERENCES

A. Manufacturers Data and Recommended Installation Requirements

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Provide Manufacturer's Product Data (MPD), Material Certificate and samples as noted:

1. Metal Bollard Cover (¼" nominal wall thickness polyethylene thermoplastic): MPD
2. Metal Bollard Cover (¼" nominal wall thickness polyethylene thermoplastic): Sample and Color Selection Chart
3. Reflective Tape: MPD and Sample

1.5 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect when footing location(s) for metal bollards are coordinated to avoid underground utilities and marked in the field.

1.6 QUALITY ASSURANCE

A. Manufacturer's warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

B. Minimum (5) year warranty against fading.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to project site in wrapped, neat, secure condition. Provide means to unload products from delivery trucks.

B. Protect all products and installation area from vandalism, theft, other construction, premature use, etc. until Owner acceptance and Architect sign off.

C. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately reordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

2.0 PART 2 - PRODUCTS

2.1 METAL BOLLARD

A. Pipe: Shall be galvanized schedule 40 steel pipe, 6 inch ID, 6.625” OD.

B. Concrete: Shall be 4000 psi as specified in Section 321301.

2.2 REFLECTIVE TAPE: Shall be exterior grade, reflective. Standard of quality shall be Scotchgard, as manufactured by 3M or Architect approved equal. Color as noted on detail.

2.3 BOLLARD COVER: Shall be made of ¼" nominal wall thickness polyethylene thermoplastic (HDPE). Top shall be domed. Standard of quality shall be as manufactured by Ideal Shield or Architect approved equal. Color shall be selected by Owner, and approved by Architect.

3.0 PART 3 - EXECUTION

3.1 INSTALL METAL BOLLARD

A. Shop cut bollard.

B. Locate per plan and install as detailed. Neatly saw cut pavement or install bollards before paving.

C. Auger hole for concrete footing. Set metal bollard in center of hole and brace plumb and vertical.

D. Fill annular spaces around and inside metal bollard with concrete. Dome top of concrete footing and concrete inside metal bollard to shed water. Check for plumb alignment.

E. When concrete has set, remove braces.

F. Install bollard cover and reflective tape per manufacturer's recommendations.

G. Finished metal bollard shall be set plumb. Cover shall be smooth and free of chipped or cracked areas. Protect bollards until accepted.

3.2 CLEAN UP

During the contract and at intervals as required by the contract documents and as directed by the Architect and as metal bollards are installed, clear the site of all extraneous materials, rubbish, and debris. Leave the site in a clean, safe, well-draining, neat condition.

END OF SECTION 323002

SECTION 323003 - ALUMINUM HAND AND SAFETY RAILING

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of aluminum hand and safety railing is shown on the drawings. Provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications. (**NOTE:** Aluminum hand and safety rails to be installed at Gillette Road Middle School only.)

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321301 - Site Concrete Work

1.3 SUBMITTALS

A. Shop Drawings, Samples, and Manufacturer's Data: Provide five copies stamped and approved by the Contractor before submittal to the Architect. Submit to the Architect for review a minimum of two weeks before delivery to site.

B. Required submittals are:

1. Aluminum Hand and Safety Railing: Shop Drawings
2. Finish: Sample

1.4 JOB CONDITIONS

A. All job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect when aluminum hand railing is staked out.

C. Materials and methods of construction shall comply with the following standards:

The Aluminum Association (AA)
American Welding Society (AWS)
National Association of Architectural Metal Manufacturers (NAAM)

2.0 PART 2 - PRODUCTS

2.1 ALUMINUM HAND AND SAFETY RAILING

A. Posts and Rails: 6063-T6, Schedule 40 aluminum pipe, meeting ASTM B221. Posts and rails 1-1/2" nominal pipe size with 1.90" O.D. and with a minimum wall thickness of 0.125”. Baluster pickets at safety railing shall be 1” x 1” with a minimum wall thickness of 0.125”.

B. Cover Plate: 6063-T6 aluminum trim component, meeting ASTM B221. Size as detailed.

C. Finish: Anodized finish conforming to MIL-A-8625 Type II. Color: #335 - Black.

D. Sleeve: 3" O.D. Schedule 40, hot-dipped galvanized steel pipe, meeting ASTM A-36.

3.0 PART 3 - EXECUTION

3.1 FABRICATION

A. Take field measurements and coordinate work with others.

B. Shop fabricate in accordance with field measurements, favorably reviewed shop drawings and standards referenced above in Job Conditions.

C. Provide continuous weld shop connections, except as otherwise indicated. Grind smooth welds and surfaces exposed to touch.

D. Provide metal fabrications work square, plumb, straight and true to shop drawing dimensions.

E. Bend or form pipe to continuous and true curves, with joints neatly welded and assembled.

F. Provide for anchorage of type required, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

G. Fabricate, preassemble and finish assembly in shop to greatest extent possible to minimize field fitting and assembly.

3.2 FIELD INSTALLATION

A. Do not install hand and safety rail posts until concrete has attained its full design strength (approximately 28 days). Transport safely and install as detailed.

3.3 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as aluminum hand and safety railing installation is completed, clear the site of all extraneous concrete, gravel, asphalt or debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323003

SECTION 323004 – STEEL HAND RAILING

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of railing work is shown on the drawings. (**NOTE:** Steel handrails to be installed at North Syracuse Junior High School only.)

B. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

C. Hot-dip galvanizing of steel materials.

D. Preparation of hot dipped galvanized steel for painting.

E. Painting.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321301 - Site Concrete Work

B. Section 323007 – Concrete Modular Retaining Wall

1.3 REFERENCES

A. Publications:

1. American Galvanizers Association (AGA):

   a. Inspection of Products Hot-dip Galvanized After Fabrications
   b. The Design of Products to be Hot-dip Galvanized After Fabrication
   c. Recommended Details of galvanized Structures
   d. Quality Assurance Manual

2. Research Council on Structural Connections of the Engineering Foundation:

   a. Specification for Structural Joints Using ATM A 325 or A 490 bolts.

3. Elsevier, van Eijnsbergen, J.F.H., New York, 1994:

   a. Duplex Systems - Hot-Dip Galvanizing Plus Painting Wet Storage Stain

4. The Society for Protective Coatings (SSPC):

   a. Surface Preparation Specification No. 1 Solvent Cleaning
   b. Surface Preparation Specification No. 2 Hand Tool Cleaning
   c. Surface Preparation Specification No. 3 Power Tool Cleaning
   d. Surface Preparation Specification No. 7 Brush-Off Blast Cleaning

B. Reference Standards:

1. American Society for Testing and Materials (ASTM):

   a. A 123/ A 123M Zinc (Hot-dip Galvanized) Coating of Iron and Steel Products
   b. A 143 Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
   c. A 153/ A 153M Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   d. A 384 Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
   e. A 385 Practice for providing High-Quality Zinc Coating (Hot-Dip)
   f. A 767/ A 767M Specification for Zinc Coating (Galvanized) Steel Bars for Concrete Reinforcement
   g. A 780 Repair of Damaged Hot-Dip Galvanized Coatings
   h. B 6 Specification for Zinc
   i. D 6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
   j. E 376 Practice for Measuring Coating Thickness by magnetic-Field or Eddy-Current (Electromagnetic) Test Methods

2. Federal Specifications:

   a. DOD-P-21035 Painting, High Zinc Dust Content, Galvanizing Repair
   b. MIL-P-26915 Primer Coating, Zinc Dust Pigmented

1.4 QUALITY ASSURANCE

A. Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following the procedures in the Quality Assurance Manual of the American Galvanizers Association.

B. Pre-construction Conference for Metal Fabricators: Contractor shall schedule a meeting to be attended by contractor, Architect, fabricator, and galvanizer. Topics to be addressed include project schedule, scope of metal fabrications, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, submittals and approvals.

C. Coordination Between Fabricator and Galvanizer: Prior to fabrication, fabricator shall submit approved fabrication shop drawings to the galvanizer. The Galvanizer shall review fabricator shop drawing for suitability of materials for galvanizing and coatings and coordinate any required fabrication modifications.

D. Materials: For steel to be hot-dip galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25%, phosphorous below 0.04%, manganese below 1.3% and silicon below 0.04%. Notify the galvanizer if steel does not meet these requirements so that suitability for galvanizing may be determined and whether special techniques are required.

1.5 SUBMITTALS: (See Section 311201, 1.5)

A. Submit fabrication shop drawings for review by Architect of railings.

B. Provide Manufacturer's Product Data (MPD), finish color paint sample and shop drawings. Shop drawings shall show the railings in plan, elevation and section with details of connections, showing anchorage and accessory items.

C. Submit an original and two copies of the coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A 123/ A 123M, A 153/ A 153M, or A767, as applicable.

1.6 JOB CONDITIONS

A. Job conditions in Section 311201 apply.

B. Construction Review: Notify the Architect when locations of railing are staked out.

C. No work shall be fabricated until shop drawings for the work have been favorably reviewed by the Architect.

1.7 DELIVERY, STORAGE & HANDLING

A. Store and protect products under the provisions of Division 01.

B. Load and store galvanized articles in accordance with acceptable industry standards.

2.0 PART 2 - PRODUCTS

2.1 CONCRETE

Shall be as specified in Section 321301.

2.2 STEEL HAND RAILING: Provide metal surfaces exposed to view smooth and free of pitting, seam marks, roller marks, rolled trade names and roughness.

A. Posts and rails: 1-1/2" o.d. schedule 40 steel, meeting ASTM A-36. Shall be steel tubing, ASTM 500, grade A, fabricated in panels in reasonable lengths for transport and to reduce the quantity of field welding and field touch up painting. 1" x 1" baluster (pickets) shall be solid bar stock. Fabricate for standard sections not deviating from dimensions on details. Materials and methods of construction shall comply with the following standards:

American Institute of Steel Construction, (AISC)
American Welding Society, (AWS)
National Association of Architectural Metal Manufacturers, (NAAMM)

B. Steel Materials:

1. Material for galvanizing to be geometrically suitable for galvanizing as described in ASTM A 384 and A 385. Steel materials suitable for galvanizing include structural shapes, pipe and assemblies.

2. Material to be chemically suitable for galvanizing. Recommended steel materials for hot-dip galvanizing include but are not limited to:

   a. Structural shapes and plates: ASTM A 36, A 242 Type 2, A 283, A 441, A 500, A 501, A 529, A 572, A 588 and A 992.
   b. Steel for pipe or tubing: ASTM A 53, A 120 or A 595, Gr A or B.

C. Fabrication:

1. Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's Recommended Details for Galvanized Structures.

2. Fabrication practices for products to be in a accordance with the application portions of ASTM a 143, A 384 and A 385, except as specified herein. Avoid fabrication techniques that could cause steel distortion or embrittlement.

3. The fabricator shall consult with Architect and hot-dip galvanizer regarding potential concerns, including handling issues, during the galvanizing process that may require design modification before fabrication proceeds.

4. Fabricate work in accordance with reviewed and accepted shop drawings and referenced standards.

5. Shop weld connections, except as otherwise indicated. Grind smooth welds and surfaces exposed to touch.

6. Provide joints and intersections tight fitting and securely fastened.

7. Provide metal fabrications work square, plumb, straight, and within allowable tolerances.

8. Drill or punch holes required for attachment of other work and bolted connections. Burned holes not acceptable.

9. Bend or form pipe and other members to continuous and true curves, with joints neatly fastened and assembled.

10. Provide for anchorage of type required, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

11. Fabricate and preassemble items in shop to greatest extent possible to minimize field fitting and assembly.

12. Remove all welding slag, splatter, anti-splatter compound and burrs prior to delivery for galvanizing.

13. Provide holes and/or lifting lugs to allow for handling during galvanizing.

14. Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint and other deleterious material prior to fabrication.

15. Remove by blast-cleaning, or other methods, surface contaminants and coatings that are not removable by the normal chemical cleaning process in the galvanizing operation.

D. Hot Dip Galvanizing: Provide a zinc coating for those items specified to be galvanized as follows:

1. ASTM A153, for galvanizing iron and steel hardware.

2. ASTM A123, for galvanizing rolled, pressed, and forged steel shapes, plates, bars, and strips 1/8" thick and heavier.

3. ASTM A386, for galvanizing assembled steel products.

E. Hot-Dip Galvanized Materials: Material for surface preparation to be suitable for powder coating is required to be Hot-Dip galvanized as described in ASTM A 123/A 123M and A 153/A 153M. Hot-Dip galvanized articles and fabrications may be newly galvanized, partially weathered or completely weathered.

F. Hot-Dip Galvanizing Requirements:

1. Hot-Dip galvanizing practices shall be in accordance with the applicable portions of ASTM A 123/A 123M and A 153/A 153M.

2. Water quenching or chromate conversion coating should be avoided as these processes interfere with paint adhesion and surface preparation.

3. Clean surface free of oil and grease. Prepare surface to promote adhesion by either applying chemical conversion coating or by brush blasting. If the blast clearing exposes bare steel, the bare steel shall be spot primed with an organic zinc rich coating.

G. Powder Coating

1. Shall be a thermosetting, super durable, TGIC polyester powder of a degassing grade.

2. The thickness of the polyester coating shall be a minimum of 3.5 mils when measured per ASTM D 1186. Using a 67 -1/2 volt wet sponge detector, the polyester coating shall be checked for holes, pinholes, and discontinuities. There shall be no more than one deficiency per 5 square feet.

3. The powder coating component of the duplex coating shall, at a minimum, meet the following requirements:

Direct impact	: ASTM D 2794	160 in/lb (9.0 m/kg)
Reverse impact	: ASTM D 2794	160 in/lb (9.0 m/kg)
Pencil hardness (scratch/gouge)	: ASTM D 3363	2H
Flexibility (Mandrel test)	: ASTM D 5221/8 in. (3m mm)	

Minimum adhesion crosshatch)	: ASTM D 3359	5A, 5B (100%
Salt spray	: ASTM B 117	+ 1000 hrs < 2mm
Gloss loss	: AAMA 2604-05	40% @ 5 yrs (S. Florida)
Color change	: ASTM D 2244	≥ ΔΣ 5.0 (Hunter Scale)

4. **Repair.** Material used for the touch up system shall be a two component aliphatic polyurethane, and color matched for patching the polyester coating used. The coating thickness of the touch up material shall be the same as the thickness of the polyester and can be applied in multiple coats.

5. **Color :** Shall match the color on adjacent stair hand railss as approved by Architect

3.0 PART 3 - EXECUTION

3.1 INSPECTION

Inspect substrates, field measure and verify installation conditions.

3.2 FABRICATION PREPARATION

A. Fabricate and assemble in shop where temperature, humidity, and dust conditions are controlled.

B. Set hardware that is shop installed.

3.3 SURFACE PREPARATION FOR HOT-DIP GALVANIZING

Pre-clean steel work in accordance with accepted methods to produce an acceptable surface for quality hot-dip galvanizing.

3.4 HOT-DIP GALVANIZED COATING APPLICATION

A. Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A123/123M.

B. Safeguard products against steel embrittlement in conformance with ASTM A 143.

C. Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

3.5 POWDER COATING REQUIREMENTS

A. Conform to paragraph 6.1 of ASTM A 123/A 123M, Table 1 of A 153/A 153M or Table 2 of A 767, as appropriate.

B. Surface finish: Continuous, adherent, as smooth and evenly distributed as possible and free from any defect detrimental to the stated end use of the coated article.

C. Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

3.6 TESTS

A. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the AGA publication Inspection of Products Hot-dip Galvanized after Fabrication.

B. Include visual examination and tests in accordance with ASTM A 123/A 123M and A 153/A 153M or A 767, as applicable, to determine the thickness of the zinc coating on the metal surface.

C. Furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

3.7 INSTALLATION

A. Assemble and install railing in accordance with final shop drawings and manufacturer's recommendations.

B. Perform fitting required for installation. Set work accurately in location, alignment, and elevation free of rack, measured from established lines and levels.

C. Fit exposed connections accurately together and field weld together to provide flush, tight hairline joints.

D. Adjust railing sections before securing in place to ensure proper matching at butting joints and proper alignment throughout their length. Space posts as indicated, when not indicated at maximum five (5' o.c.) feet on center. Plumb posts in each direction. Refer to drawings and details for post installation in concrete footings.

E. Assembled railing shall be firm, rigid, free of rattle and plumb. Connections shall provide maximum protection against tampering and vandalism.

F. Field touch paint chipped and scratched posts. Protect adjacent surfaces from paint spill and overspray. Clean spills and overspray.

G. Protect the railing from damage until final acceptance.

3.8 REPAIR OF DAMAGED COATING

A. The maximum are to be repaired is defined in accordance with ASTM A 123/A 123M Section 6.2, current edition.

1. The maximum area to be repaired in the field shall be determined in advance by mutual agreement between parties.

B. Repair areas damaged by welding, flame cutting or during handling, transport or erection, by one of the approved methods in accordance with ASTM A 780 whenever damaged exceeds 3/16" (4.8 mm) in width. Minimum thickness requirements for the repair are those described in ASTM A 123/A 123M Section 6.2 current edition.

3.9 CLEAN UP

During the contract and at intervals as directed by the Architect and as railing installation is completed, clear the site of extraneous metal pieces, unused railing sections, concrete, gravel, asphalt or debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323004

SECTION 323005 – SCOREBOARD WORK

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the scoreboard work is shown on the drawings.

B. Work includes, but is not limited to, the following:

1. Reinforced Concrete Footings and Painted Steel Structural Columns/Supports and Bracing for Owner provided Scoreboards / Delay of Game Clocks.
2. Trenching, Backfill and Compaction for Vertical Slab Footings
3. Cleanup

C. Provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications.

1.2 RELATED SECTIONS

A. Section 311201 - Site Preparation

B. Section 321301 - Site Concrete Work

1.3 REFERENCES

A. N/A

1.4 SUBMITTALS

A. Shop Drawings: Contractor to provide complete detailed drawings prepared, signed, and sealed by a Registered Professional Engineer (P.E.) licensed in the State of New York. Include:

1. Detailed and dimensioned drawings for steel columns and footing steel.
2. Footings and foundation sizes and types and relationships to finish grade in compliance with construction documents. Exposed portions of foundations, pier height and top elevations shall be subject to Architect approval.
3. Engineering calculations.
4. Minimum sizes for structural steel and foundations are shown on bid document drawings, in order to establish an equal bidding opportunity for all participants. Reduction in minimum sizes of concrete foundation and structural steel will not be allowed.
5. Qualifications of NYS Professional Engineer who seals the shop drawings and calculations.
6. Qualifications of AISC Certified Steel fabricator.

B. Material Certificate: 4,000 psi concrete mix design for footings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Product delivered on site.

B. Scoreboard, video display, and equipment to be housed in a clean, dry environment.

C. Contractor shall be responsible for site access and layout coordination of scoreboard footings with the Owner's Scoreboard Vendor.

1.6 PROJECT CONDITIONS

A. Field measurements: Verify position and elevation of structure and its layout for scoreboard equipment. Verify dimensions by field measurements and coordination with Owner's Scoreboard Vendor.

B. Verify mounting structure is capable of supporting the scoreboard's weight and wind load in addition to the auxiliary equipment. Structure and components must be designed to meet or exceed a 115 mph, 3 second gust wind design per NYSBC 2020, Category II, Exposure C.

C. Soil bearing capacity to be verified by Contractor prior to placement of footings. Foundation sizes if shown on drawings will not be reduced under any circumstances.

D. All job conditions in Section 312201 apply.

1.7 QUALITY ASSURANCE

A. AISC Certification: All structural steel shall be fabricated in an American Institute of Steel Construction (AISC) certified plant that is certified "STD" at the time of the bid. The manufacturer shall be listed on AISC's website as a certified fabricator.

2.0 PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel:

1. All detailing, fabrication, and erection shall be completed in accordance with the AISC Steel Construction Manual 13th Edition. All fabrication shall be completed in an AISC certified facility as described in Paragraph 1.7 A.
2. Structural Steel shall be ASTM A572 multi-certified grade 50. Miscellaneous steel shall be ASTM A36.
3. Bolts & Nuts: All bolts 1" diameter and larger shall meet ASTM F1554 Grade 36 A.B.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify location of footings and steel with Owner and Scoreboard Vendor prior to installation.

3.2 INSTALL STEEL COLUMNS AND CONCRETE FOOTINGS

A. Install steel columns and concrete footings as shown on the drawings and per Owner's Scoreboard manufacturer's recommendations.

3.3 CLEAN UP

During the contract and at intervals as directed by the Architect and as scoreboard installation is completed, clear the site of extraneous metal pieces, unused fence sections, concrete, stone, asphalt, or debris. Leave the site in a clean, safe, well-draining, neat condition.

END OF SECTION 323005

SECTION 323006 – SITE FURNISHINGS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of seat slats on concrete parapet walls (benches) are shown on the drawings.

B. The extent of bench(es) are shown on the drawings.

C. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 321301 - Site Concrete

1.3 SUBMITTALS: (See Section 311201, 1.5)

A. Provide Manufacturer's Product Data (MPD).

B. Color Chart for seat slats: Provide standard color chart. Owner to approve color.

C. Sample: Provide Owner approved sample.

1.4 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect in writing a minimum of two (2) weeks prior to when seating slats are to be installed.

C Construction Review: Notify the Architect in writing a minimum of two (2) weeks prior to when precast concrete benches are to be installed.

2.0 PART 2 - PRODUCTS

2.1 SEAT SLATS

A. Shall be purified high density polyethylene, extruded to a rectangular pattern, smooth finished four sides to a 1-3/8” x 2-1/4” size, and have their edges and ends heavily eased. Assembly hardware shall be stainless steel. Each seat frame shall be welded into a single unit. Welds shall be smooth, continuous with no gaps or pin holes, and free of weld spatters and burrs. Frames shall be coated with CASPAX-7™, a tough, opaque, UV resistant exterior grade polyester powder coating to a minimum thickness of 6 mils. Liquid, epoxy or lead-containing powder coatings are not acceptable. Preparation of the mild steel substrate shall incorporate the phosphate system. Substrate preparation shall consist first of mechanical cleaning to remove heavy mill scale, rust, varnish, grease, etc. with surfaces uniformly abraded to promote quality of finish coating. Chemical cleaning in accordance with TT-C-490C, Methods I and III shall remove impurities from the surfaces. After the two-step cleaning process, the metal substrate shall receive a

corrosion-inhibiting iron phosphate pre-coating in accordance with TT-C-490C, Type II, prior to the application of the powder color coat. The color coating shall be applied by the electrostatic method and then oven-cured at 400 degrees Fahrenheit to chemically bond the coating to the substrate and to render the coated metal resistant to abrasion, impact, chipping, weathering, and rusting. Color shall be determined by the Owner.

B. Standard of quality shall be 521/523 Bench Series, Model 521-60PL with Recycled Plastic slats, as manufactured by DuMor., (800) 598-4018 (www.dumor.com), as distributed by Parkitects (607) 731-7496 or Architect approved equal.

2.2 CONCRETE: 4,000 psi concrete as specified in Section 321301.

3.0 PART 3 - EXECUTION

3.1 INSTALL SEAT SLATS

A. Locate as shown on drawings.

B. Confirm concrete parapet wall (bench) concrete has properly cured prior to installing seat slats.

C. Orient seat slats as shown on drawings. Install as detailed per Manufacturer's instructions.

3.2 CLEAN UP

During the contract and at intervals as directed by the Architect and as seating slat installation is completed, clear the site of extraneous packaging materials, slats, and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323003

SECTION 323007 - TRAFFIC SIGNS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of traffic signs is shown on the drawings.

B. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 SUBMITTALS: (Provide Section 311201, 1.5)

A. Provide shop drawings for each different type and size of sign listed in the Traffic Sign Schedule.

B. Provide MPD for signposts, breakaway system, and sign plates.

1.3 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. No work shall be fabricated until shop drawings for the work have been favorably reviewed by the Architect.

C. Construction Review: Notify the Architect when locations for signs are coordinated to avoid underground utilities and marked in the field for review.

D. Provide posts, bolts, splice bars, sign plates and build in coordination with work of other trades.

2.0 PART 2 - PRODUCTS

2.1 SIGNS

A. Sign Plate:

1. Sign Plate shall be aluminum sheets .090" (approximately 3/32") thick, with two coats of Dupont Imron spray semigloss paint.

2. Letters, numbers, symbols, and arrows shall be engineering grade, (EG) reflective. Sign plates, letters and numbers shall meet the colors and regulations described in the "Manual of Uniform Traffic Control Devices", latest edition, as published by the State of New York Department of Transportation, Division of Traffic and Safety.

3. The following Traffic Sign Schedule shall apply:

SIGN WORDING	SIGN NO.	SIZE	LETTER SIZE / COLORS
Stop	R1 - 1C	30" x 30"	10"C/White and Red

HC Reserved Parking w/ Van Accessible	P4 - 6C	12" x 18"	2" Green/White Blue Background
	P3-8(NY)	12" x 6"	2" Green/White Background
No Parking Any Time	P1-1	12" x 18"	3"C/Red on White
Turf Regulations *	N/A	As Detailed	As Detailed

* This is a custom sign for the school district, refer to details for wording.

4. Refer to Traffic Sign Schedule and/or sign details on drawings for sign wording, quantities, and other information.

5. Hardware shall be galvanized.

6. Standard of quality shall be as manufactured by Eastern Metal/USA-Sign, www.usa-sign.com or Architect approved equal.

B. Breakaway Signposts:

1. Shall be minimum 2.5 lbs. / ft high carbon new billet steel (SP-80) U-channel posts with predrilled 3/8" holes at 1" on center.

2. Crashworthy to NCHRP 350 criteria. Meeting FHWA (Federal Highway Administration) for small sign support applications.

3. Lap Splice U-channel Breakaway System shall be 3/8” x ¾” x 5” and sized to post, bar color silver. Special manufacturer designed bolts for lap splice are required.

4. Hot dipped galvanized.

5. Standard of quality shall be “Rib-Bak” U-channel signposts as manufactured by NUCOR Steel Marion, Inc. www.nucorhighway.com (800) 333-4011 or Architect approved equal.

3.0 PART 3 - EXECUTION

3.1 INSTALL SIGNS

A. Erect signs plumb. Drive posts into firm ground or bolt to sleeve in pavement areas or concrete footings as detailed. Use driving caps to avoid deforming posts.

B. Mount sign plates at heights detailed. Attach metal sign plates to steel posts securely with 1/4" galvanized allen head screws.

C. Install "TURF REGULATIONS" signs at each gate entry and as indicated on the plans. Install on fence and anchor securely with vandal resistant hardware.

3.2 CLEAN UP

During the contract and at intervals as directed by the Architect and as traffic sign installation(s) are completed, clear the site of extraneous paint, fasteners, concrete, gravel, asphalt, and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323007

SECTION 323008 – POLE-TO-POLE TENSION NETTING BACKSTOP SYSTEMS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of pole-to-pole tension safety netting system with integrated wall pad backstop and sideline extension are shown on the drawings and includes, but is not limited to, the following:

1. Poles
2. Wire rope support structure
3. Netting
4. Wall padding
5. Sideline extentions

B. Provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321301 - Site Concrete Work

1.3 REFERENCES

A. Comply with applicable requirements for the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. National Federation of State High School Associations (NFHS)
2. International Association of Athletics Federations (IAAF)
3. American Sports Builders Association (ASBA)
4. Manufacturers Data and Recommended Installation Requirements

1.4 SUBMITTALS

A. Provide Qualification Experience requirements as specified in "Quality Assurance" of this section. Provide a list of completed projects including Owner contact information.

B. Manufacturer's Product Data (MPD): Manufacturer's catalog cuts indicating material compliance and specified options.

C. Shop Drawings: Provide drawings of the manufacturers recommended installation and foundation requirements prior to actual field installation work, for Architect or Owner representatives review. Provide footing sizes and hardware list.

D. Samples: 6" x 6" section of netting, wall pad (color)

1.5 JOB CONDITIONS

A. All job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect when fence and gates are staked out.

1.6 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements. The Manufacturer shall have a current American Sports Builders Association (ASBA) Supplier Certificate of Distinction designation.

B. Manufacturer: Company having manufacturing facilities in the United States with five (5) years experience specializing in manufacturing of tension netting products.

C. Backstop Contractor: Contractor having five (5) years experience installing similar projects in accordance with ASTM F567.

D. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.

E. Single source: To ensure system integrity obtain the netting system, framework, fittings, and accessories from a single source.

1.7 PRODUCT DELIVERY AND STORAGE

A. Materials delivered to the site shall be examined for damage and defect in shipping. Any defects shall be noted and reported to the Owners representative. Replacement, if necessary, shall be immediately reordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

1.8 WARRANTY

A. Provide manufacturer's standard limited warranty that its backstop system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of fifteen (15) years from the date of purchase.

2.0 PART 2 - PRODUCTS

2.1 POLE TO POLE TENSION NETTING SYSTEM WITH INTEGRATED WALL PAD BACKSTOP

A. TNPPUCWPB – Pole-to-Pole Tension Netting System with Integrated Wall Pad Backstop Height as shown on drawings, Ultra Cross Netting and Sideline Extensions as manufactured and/or supplied by:

Sportsfield Specialties, Inc.
P.O. Box 231
41155 State Highway 10
Delhi, NY 13753

p. 888-975-3343
f. 607-746-8481
www.sportsfieldspecialties.com

B. Components:

1. Pole-to-Pole Tension Netting System Upright Support Posts and Pole Structures – Fabricated, Sized and Configured as Required:
    a. Height Above Grade at Backstop Area as shown on drawings
        i. (4) Backstop Poles as Shown on Drawings to be 8.625”x0.322 Single Piece Steel Poles for Backstop
        ii. (4) Extension Poles Total as Shown on Drawings to be 8.625”x0.322 Singles Piece Steel Poles for Extensions
    b. Super Durable Powder Coated Black Finish with Enhanced Resistance to UV and Fade
    c. Ground Sleeve Embedment Mount - OPTIONAL
    d. Hot Dipped Galvanized Assembly Hardware - Quantities, Sizes and Configurations as Required
    e. Poles to be Non-Spliced and Include Welded Attachment Tabs for all Netting and Integrated Wall Attachment

2. Pole-to-Pole Tension Netting System Wire Rope Support Structure:
    a. Length, Height and Configuration as Required
    b. 7 x 19 GAC Galvanized Aircraft Cable - 5/16” Diameter Main Horizontal Support, 9,800 lb. Minimum Breaking Strength, 3,267 lb. Minimum Working Load Limit
    c. 7 x 19 GAC Galvanized Aircraft Cable - 1/4” Diameter Vertical and Bottom Horizontal Supports, 7,000 lb. Minimum Breaking Strength, 2,333 lb. Minimum Working Load Limit
    d. Hot Dipped Galvanized Attachment and Assembly Hardware Quantities, Sizes and Configurations as Required

3. Pole-to-Pole Tension Netting System Net and Rope Bound Border:
    a. Length, Height and Configuration as Required
    b. Ultra Cross Knotless Netting
    c. Dyneema® Ultra-High Molecular Weight Polyethylene (UHMWPE) SK-75 Black Fiber Construction
    d. 4 Ply, 1.2 mm (0.0472”) Diameter Twine
    e. 95% Open Mesh Area (See-Through Visibility)
    f. 58,445 psi Minimum Breaking Strength
    g. 30% Maximum Elongation at Break
    h. 1-3/4” (44 mm) Square Mesh Size, 0.009 lbs. per Square Foot
    i. 4-Strand, Braided, Continuous Monofilament Dyneema® Fiber
    j. Black Multi-Filament Polypropylene Solid Braid Derby Rope Sewn Binding on Perimeter Edges - 1/4” Diameter, 530 lb. Minimum Breaking Strength
    k. Urethane Black Bonded Finish
    l. Strong Resistance to Ultraviolet (UV) Light Degradation

m. Excellent Resistance to Chemicals and Water Absorption

4. Integrated Wall Pad Backstop Intermediate Support Poles:
   a. 4.00" Dia. HSS Intermediate Poles with 7 Gauge Steel Welded Mounting Tabs
   b. 30" Ground Sleeve Embedment Mount Standard for All Heights
   c. Super Durable Powder Coated Black Finish with Enhanced Resistance to UV and Fade
   d. Height Above Finish Grade, Configuration, and Quantity as Required

5. Integrated Wall Pad Backstop Rail Support Structure and Mounting Brackets:
   a. Quantity and Configuration as Required
   b. 2 ½" SQ. x 11 Gauge Wall Thickness Steel Rail Support Structure
   c. 7 Ga. Steel Bracketry for Rail Mounting
   d. Super Durable Powder Coated Black Finish with Enhanced Resistance to UV and Fade

6. BaseZone® Wall Pads and Backer Board:
   a. Length, Height, and Configuration as Required
   b. 18 oz. Exterior Vinyl (Color selected by Owner)
   c. ¾" Advantech ® Water Resistant Sheathing Panel, Sealed and Stained with Exterior Grade Black Finish
   d. Digitally Printed Graphics for Padding
   e. Aluminum Z-Clip Style Mounting Brackets, (2) Sets per Pad
   f. 11 Ga. Steel U-Bracket for Backer Board Mounting, Super Durable Powder Coated Black Finish with Enhanced Resistance to UV and Fade

7. Included Accessories:
   a. Hot Dipped Galvanized Attachment and Assembly Hardware - Quantities, Sizes and Configurations as Required
   b. Black Rope for Net Binding Attachment to Wire Rope Support Structure – Quantities and Configurations as Required
   c. Stamped and Sealed Drawings and Calculations by a Licensed Professional Engineer of Record in the State of Project Location
   d. Model Specific Hardware Kit and Installation Instructions
   e. One (1) Year Limited Manufacturer's Product Warranty

C. Color System: All posts, rails, fittings, fabric, hardware, and tension bars shall be black in compliance with ASTM F934.

D. Two (2) backstops with integrated walls and sideline extensions required.

E. Standard of quality: shall be model TNPPUCWPB as manufactured by Sportsfield Specialties, Inc. or Architect approved equal.

2.2 CONCRETE FOOTINGS

A. Shall be 4,000 psi as specified in Section 321301, 2.1.

3.0 PART 3 - EXECUTION

3.1 SITE EXAMINATION AND PREPARATION

A. Ensure property lines and legal boundaries of work are clearly established.

B. Survey of backstop location to be provided by Site Contractor.

C. Clearing: The Site Contractor shall clear, grub and remove vegetation/debris for the backstop installation area.

D. Verify areas to receive backstop are completed to final grade with finished elevations shown on the drawings.

3.2 BACKSTOP FRAMEWORK INSTALLATION

A. Locate posts.

B. Excavation: Drill holes of diameters and spacings shown, for post footings in firm, undisturbed or compacted soil.

1. Excavate hole depths as detailed when in firm, undisturbed soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

2. Remove soil excavated from site.

C. Setting Posts: Remove all loose and foreign materials from sides and bottoms of holes.

1. Center and align posts in holes. Install posts plumb, in neat, straight lines, and with minimal waviness of top railing.

2. Install reinforcing bars as indicated.

3. Place concrete around posts in a continuous pour and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.

4. Top of footing shall meet elevation as indicated on drawings so that grade beam can be placed over as shown.

5. Keep exposed concrete surfaces moist for at least 7 days after placement, or cure with curing material, or other acceptable method.

D. Concrete Strength: Allow concrete to attain at least 75% of its minimum 28-day compressive strength, but in no case sooner than 7 days after placement, before rails,

tension bands or fabric is installed. Do not stretch and tension fabric and wires, and do not hang gates until the concrete has attained its full design strength.

E. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

F. All Pole-to-Pole Tension Ball Safety Netting Systems with Ultra Crossing and Accessories shall be installed as recommended per manufacturer's written instructions and as indicted on the drawings.

G. Provide pole-to-pole tension safety netting backstop systems at the baseball and softball fields as indicated on the drawings.

3.3 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as chain link fence, backstop and gate installation is completed, clear the site of all extraneous concrete, gravel, fence material or debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323008

SECTION 323100 - VINYL CLAD CHAIN LINK FENCE, BACKSTOPS AND GATES

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of vinyl clad chain link fence, gates and backstops is shown on the drawings. (**NOTE:** All fence, gates and backstops at Gillette Road Middle School shall be black vinyl, and other locations as noted on the plans.)

B. Provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321201 - Asphalt Paving

C. Section 321301 - Site Concrete Work

D. Section 323101 – Galvanized Chain Link Fence

1.3 REFERENCES

A. ASTM F552 Standard Terminology Relating to Chain Link Fencing

B. ASTM F567 Standard Practice for Installation of Chain Link Fence

C. ASTM F626 Standard Specification for Fence Fittings

D. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric

E. ASTM F900 Standard Specification for Industrial and Commercial Swing Gates

F. ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials

G. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework

H. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

I. WLG 2445 Chain Link Fence Manufacturers Institute, Chain Link Fence Wind Load Guide for the Selection of Line Posts and Line Post Spacing.

J. Americans with Disabilities Act (ADA) Standards, Adopted by the US Department of Justice 2010, or latest edition.

1.4 SUBMITTALS

A. Provide Qualification Experience requirements as specified in "Quality Assurance" of this section. Provide a list of completed projects including Owner contact information.

B. Manufacturer's Product Data (MPD): Manufacturer's catalog cuts indicating material compliance and specified options.

C. Shop Drawings: For fence, backstops, and gates including plan layout and details illustrating fence heights, location and sizes of posts, finishes, rails, braces, and installation procedures. Provide footing sizes and hardware list.

D. Samples:

1. 4" section of line post with specified vinyl coating.
2. 12" x 12" section of vinyl fence fabric .

E. PVC Fence Cap and Privacy Slats: MPD and color chart for Owner selection.

F. Provide a copy of manufacturers 15-year warranty.

1.5 JOB CONDITIONS

A. All job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect when fence and gates are staked out.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company having manufacturing facilities in the United States with five (5) years experience specializing in manufacturing of chain link fence products.

B. Fence Contractor: Contractor having five (5) years experience installing similar projects in accordance with ASTM F567.

C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.

D. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.

1.7 WARRANTY

A. Provide manufacturer's standard limited warranty that its chain link fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of fifteen (15) years from the date of purchase.

2.0 PART 2 – PRODUCTS

2.1 GENERAL

A. Vinyl Chain Link Fence and Gates: Shall conform to Chain Link Fence Manufacturer's Institute specifications. See drawings for sizes of posts and fabric.

B. All posts, rails, fittings, fabric and tension bars shall be vinyl coated galvanized steel, painting of these items will not be acceptable.

C. Color System: All posts, rails, fittings, fabric, hardware, and tension bars shall be black in compliance with ASTM F934.

D. Standard of quality: shall be Color Bond II, Class 2b as manufactured by Merchant Metals, (888) 260-1600 or Architect approved equal.

E. All operable parts of gate shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. No force greater than 5 pounds shall be required to operate.

2.2 CHAIN LINK FABRIC

A. The base metal of chain-link fabric is composed of commercial quality medium high carbon, hot-dipped galvanized steel wire. Core wire tensile strength 75,000 psi.

B. The vinyl coating is securely fused over the galvanized steel wire by the Thermal Fusion process under pressure to 5,000 psi to insure a dense and impervious covering free of voids, having a smooth and lustrous surface appearance. The vinyl coating thickness, 6 mil (0.15 mm) to 10 mil (0.25 mm), zinc coating weight, and wire tensile strength conforms to ASTM F668 Class 2B. The wire shall be vinyl clad before weaving and is free and flexible at all joints. The mesh is measured by the distance between the wires forming parallel sides of the mesh. The height of the fabric, measured from the ends of the knuckles, has a permissible variation of plus or minus one inch.

C. Wire Coating: Only Plasticized Polyvinyl Chloride (PVC) with low temperature (-20 degrees C.) plasticizer, no fillers, extenders or extraneous matter, other than the necessary stabilizers and pigments are used. Colors are stabilized and have a light fastness that withstands a minimum WEATHER-O-METER exposure of 4,000 hours without any deterioration (Test Equipment Operating Light and Water Exposure Apparatus Carbon-Arc Type) ASTM-D 1499. The vinyl covering, in addition, resists attack from prolonged exposure to diluted solutions of most common mineral acids, sea water and diluted solutions of most salts and alkali.

D. Fabric is knuckled at both selvages (top and bottom). Any twisted salvage will be rejected.

Usage	Mesh Size	Break Load of Wire	Thermally Fused -Vinyl Coated Core Wire Gauge
Standard	2" (50 mm)	1290 lbF	9 ga. [0.148" (3.76 mm)]
Backstop Reinforcement	2" (50 mm)	2170 lbF	6 ga. [0.192" (4.88 mm)]

2.3 STEEL PIPE FRAME WORK

A. Steel pipe Type I: ASTM F1043 Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz/ft² (550 g/m²) on the outside and 1.8 oz/ft² (550 g/m²) on the inside surface. Exterior of pipe to have ASTM F1043 PVC thermally fused color coating, minimum thickness 10 mils (0.254 mm) to 15 mils (0.38 mm). Regular Grade: Minimum steel yield strength of 30,000 psi (205 MPa) [all sizes]

B. Top, Intermediate and Bottom Rails: Top rail is thermally fused vinyl coated galvanized steel pipe in 21 foot lengths jointed by 7" inches long sleeves, vinyl clad, to run continuously along top of fence. Bottom and intermediate rails shall conform to specifications for top rail and are jointed at line posts with vinyl clad boulevard clamps.

C. Line Posts: Line posts are thermally fused vinyl coated galvanized steel pipe. Posts are sufficient length to allow for installation as detailed and are spaced in the line of fence not farther apart than 10 feet.

D. Terminal and Corner Posts: Shall be thermally fused vinyl coated galvanized steel. Each post is of sufficient length to allow for a depth as detailed. Fabric is attached to the terminal post by means of vinyl coated tension bars and held by vinyl coated tension bands. Corner posts are placed at each change in direction or as directed by the Architect. All corner and terminal posts are braced with vinyl-clad galvanized steel 1.66 inch O.D. brace, rail, 10 feet long, with a diagonal 3/8 inch diameter truss rod, and attached to the first adjacent line post.

2.4 FITTINGS

A. All fittings to be PVC thermally fused color coated having a minimum thickness of 0.006” (0.152 mm) per ASTM F626. PVC color to match fabric and framework. Moveable parts, nuts and bolts to be field coated with PVC liquid touch up after installation.

B. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. For top rail, provide line post loop tops to secure top rail.

C. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.

D. Top rail sleeves: 7” (178 mm) PVC coated galvanized steel sleeve per ASTM F626 that allow for expansion and contraction of rail.

E. Wire ties: 9 gauge (0.148”) (3.76 mm) vinyl coated galvanized steel wire for attachment of fabric to line posts and rails. Tie wire PVC coated and in compliance with ASTM F626. Color to match fabric color.

F. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105”) (2.67mm) pressed vinyl coated steel by 3/4” (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16” (7.94 mm) galvanized carriage bolt and nut.

G. Tension (stretcher) vinyl coated galvanized steel bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.

H. Truss rod assembly: PVC coated galvanized steel minimum 5/16" (7.9mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626.

I. Carriage bolts and nuts: Galvanized of commercial quality but not vinyl coated. Provide PVC touchup paint to color coat all nuts and bolts, when fence is completed.

2.5 CHAIN LINK SWING GATES

A. Swing gates: Fabricate chain link swing gates in accordance with ASTM F900. Gate frame to be of welded construction. Weld areas to be protected with zinc-rich paint per ASTM A780 then over coated with liquid PVC to match frame. The gate frame members are to be spaced no greater than 8' 0" (2.44 m) apart horizontally or vertically. Exterior members to be 1.900" (48.3 mm) OD pipe, interior members when required shall be 1.660" (42.2 mm) OD pipe. PVC coated pipe to be [Grade 1 ASTM F1083] per section 2.3. Chain link fabric to match specification of fence system. Fabric to be stretched tightly and secured to vertical outer frame members using tension bar and tension bands spaced 12" (304.8 mm) on center and tied to the horizontal and interior members 12" (304.8 mm) on center using 9 gauge vinyl coated galvanized steel ties per section 2.4.

B. Hinges: Hot dip galvanized powder coated pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180°.

C. Latch: Powder coated galvanized forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.

D. Double gates: Provide powder coated galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide powder coated galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.

E. Keeper to secure open leafs: Provide galvanized gate hold back keeper for each gate leaf over 5' (1524 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position. Verify with Owner and Architect prior to installing.

F. Latch, hinges, moveable parts shall be field coated with liquid PVC.

G. Gate posts: PVC color coated Grade 1 pipe ASTM F108 per section 2.3.

2.6 PRIVACY SLATS

A. Privacy Slats: Slats to be manufactured from a combination of color pigments, quality high density virgin polyethylene and ultraviolet inhibitors, having a 25 year limited warranty against either color fading or breakage of slats and locking-channel used under

normal climactic extremes experienced in the Northeast. Standard PDS self- locking using horizontal bottom channel locking system. Color as directed by the Owner.

2.7 FENCE GUARD/CAP

A. Install on all 4’ ht. fencing and gates at baseball field.

B. Shall be premium grade, 3" wide x 4 ½" high, and wall thickness of .10”

C. Constructed of heavy duty, UV resistant polyethylene. Color selected by Owner.

D. 5-Year Limited Warranty.

E. Basis of design and standard of quality shall be Premium Fence Guard as distributed by Sportsfield Specialties, Inc., 888-975-3343, or Architect approved equal.

2.8 CONCRETE FOOTINGS

A. Shall be 4,000 psi as specified in Section 321301, 2.3, 2.4.

3.0 PART 3 - EXECUTION

3.1 SITE EXAMINATION AND PREPARATION

A. Ensure property lines and legal boundaries of work are clearly established.

B. Survey of fence location to be provided by Site Contractor.

C. Clearing: The Site Contractor shall clear, grub and remove vegetation/debris for the fence installation area.

D. Verify areas to receive fencing are completed to final grade with finished elevations shown on the drawings.

3.2 CHAIN LINK FRAMEWORK INSTALLATION

A. Install chain link fence system in accordance with ASTM F567, manufacturer's instructions, and Chain Link Fence Manufacture's Institute specifications.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.

C. Space line posts uniformly maximum ten (10’) feet on center.

D. Excavation: Drill holes of diameters and spacings shown, for post footings in firm, undisturbed or compacted soil.

1. Excavate hole depths as detailed when in firm, undisturbed soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

2. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site, as directed.

E. Setting Posts: Remove all loose and foreign materials from sides and bottoms of holes.

1. Center and align posts in holes. Install posts plumb, in neat, straight lines, and with minimal waviness of top railing.

2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

3. Trowel finish tops of footings, and dome surface to direct water away from posts. Extend footings for posts as detailed.

4. Keep exposed concrete surfaces moist for at least 7 days after placement, or cure with curing material, or other acceptable method.

F. Concrete Strength: Allow concrete to attain at least 75% of its minimum 28-day compressive strength, but in no case sooner than 7 days after placement, before rails, tension bands or fabric is installed. Do not stretch and tension fabric and wires, and do not hang gates until the concrete has attained its full design strength.

G. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

H. Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6’ (1829 mm) and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.

I. Top rail: Install in lengths of 21’ (6.400 m). Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.

J. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps. A center rail is required for fabric height 8'-0" and over.

K. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.

L. Fasteners: Peen ends of bolts or score threads to prevent removal of nuts. Paint all exposed surfaces, nicks or scratches, nuts and bolts, with liquid black PVC touch up paint.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on security side or play side for athletic facilities as directed by the Architect, pull fabric taut; thread the tension bar through fabric and attach to terminal posts with tension bands spaced maximum of 15” (381 mm) on center and attach so that

fabric remains in tension after pulling force is released. Install fabric so that it is above finish grade as detailed.

B. Secure fabric using wire ties to line posts at 12" on center and to rails and braces 12" on center. Tie wire shall be secured to the fabric by wrapping it two (2), 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude so as to avoid injury if a pedestrian may come in contact with the fence.

3.4 CHAIN LINK GATE INSTALLATION

A. Swing gates: Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be as shown on drawings and/or as directed by the Owner. Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 12” diameter by 48” deep. Gate leaf holdbacks shall be installed on all double gates and all gate leafs greater than 5’ (1524 mm) in width as directed by the Owner, if required.

3.5 ACCESSORIES

A. Privacy Slats: Install and lock in privacy slats in the fabric in accordance with manufacturer's instructions. Privacy slats shall only be installed at new chiller pad fence and gate work located at Gillette Road Middle School.

B. Fence Cap: Install on all 4’ ht. chain link fence and gates at the baseball field. Install as directed by the manufacturer.

3.6 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as chain link fence, backstop and gate installation is completed, clear the site of all extraneous concrete, gravel, fence material or debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323100

SECTION 323101 - GALVANIZED CHAIN LINK FENCE

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of galvanized steel chain link fence is shown on the drawings and includes, but is not limited to, the following: new galvanized steel chain link fence.

B. Provide all materials, labor, equipment, and services required to accomplish all related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321201 - Asphalt Paving

C. Section 321301 - Site Concrete Work

D. Section 323100 – Vinyl Clad Chain Link Fence, Backstops and Gates

1.3 REFERENCES

A. ASTM A392 Specification for Zinc - Coated Steel Chain Link Fence Fabric

B. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings

C. ASTM F552 Standard Terminology Relating to Chain Link Fencing

D. ASTM F567 Standard Practice for Installation of Chain Link Fence

E. ASTM F626 Standard Specification for Fence Fittings

F. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework

G. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

H. WLG 2445 Chain Link Fence Manufacturers Institute, Chain Link Fence Wind Load Guide for the Selection of Line Posts and Line Post Spacing.

1.4 SUBMITTALS

A. Provide Qualification Experience requirements as specified in "Quality Assurance" of this section. Provide a list of completed projects including Owner contact information.

B. Manufacturer's Product Data (MPD): Manufacturer's catalog cuts indicating material compliance and specified options.

C. Shop Drawings: For fence including plan layout and details illustrating fence heights, location and sizes of posts, finishes, rails, braces, and installation procedures. Provide footing sizes and hardware list.

D. Samples:

1. 4" section of line post with specified galvanized steel coating.
2. 12" x 12" section of galvanized steel fence fabric .

E. Provide a copy of manufacturers 15-year warranty.

1.5 JOB CONDITIONS

A. All job conditions in Section 312201 apply.

B. Construction Review: Notify the Architect when fence is staked out.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company having manufacturing facilities in the United States with five (5) years experience specializing in manufacturing of chain link fence products.

B. Fence Contractor: Contractor having five (5) years experience installing similar projects in accordance with ASTM F567.

C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.

D. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, and accessories from a single source.

1.7 WARRANTY

A. Provide manufacturer's standard limited warranty that its chain link fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of fifteen (15) years from the date of purchase.

2.0 PART 2 - PRODUCTS

2.1 GENERAL

A. Galvanized Steel Chain Link Fence: Shall conform to Chain Link Fence Manufacturer's Institute specifications. See drawings for sizes of posts and fabric.

B. All posts, rails, fittings, fabric and tension bars shall be galvanized steel.

C. Standard of quality: shall be galvanized steel fencing as manufactured by Merchant Metals, (888) 260-1600 or Architect approved equal.

2.2 CHAIN LINK FABRIC

A. The base metal of chain-link fabric is composed of commercial quality medium high carbon, hot-dipped galvanized steel wire according to ASTM A392 Class 2 (not less than 2 oz/sf zinc coating on uncoated wire surface). Core wire tensile strength 75,000 psi.

B. Fabric is knuckled at both selvages (top and bottom). Any twisted salvage will be rejected.

Usage	Mesh Size	Break Load of Wire	Core Wire Gauge
Standard	2" (50 mm)	1290 lbF	9 ga. [0.148" (3.76 mm)]

2.3 STEEL PIPE FRAME WORK

A. Steel pipe Type I: ASTM F1043 Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz/ft² (550 g/m²) on the outside and 1.8 oz/ft² (550 g/m²) on the inside surface. Regular Grade: Minimum steel yield strength of 30,000 psi (205 MPa) [all sizes]

B. Top, Intermediate and Bottom Rails: Top rail is galvanized steel pipe in 21 foot lengths jointed by 7" inches long sleeves, to run continuously along top of fence. Bottom and intermediate rails shall conform to specifications for top rail and are jointed at line posts with galvanized steel boulevard clamps.

C. Line Posts: Line posts are galvanized steel pipe. Posts are sufficient length to allow for installation as detailed and are spaced in the line of fence not farther apart than 10 feet.

D. Terminal and Corner Posts: Shall be galvanized steel pipe. Each post is of sufficient length to allow for a depth as detailed. Fabric is attached to the terminal post by means of galvanized steel tension bars and held by galvanized steel tension bands. Corner posts are placed at each change in direction or as directed by the Architect. All corner and terminal posts are braced with galvanized steel 1.66 inch O.D. brace, rail, 10 feet long, with a diagonal 3/8 inch diameter truss rod, and attached to the first adjacent line post.

2.4 FITTINGS

A. All fittings to be galvanized having a minimum thickness of 1.2 oz/ft² per ASTM F626. Moveable parts, nuts and bolts to be galvanized.

B. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. For top rail, provide line post loop tops to secure top rail.

C. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.

D. Top rail sleeves: 7” coated galvanized steel sleeve per ASTM F626 that allows for expansion and contraction of rail.

E. Wire ties: 9 gauge (0.148”) aluminum alloy 1100-H4 steel wire for attachment of fabric to line posts and rails.

F. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105”) (2.67mm) pressed vinyl coated steel by 3/4” (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16” (7.94 mm) galvanized carriage bolt and nut.

G. Tension (stretcher) galvanized steel bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16” x 3/4” (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.

H. Truss rod assembly: Galvanized steel minimum 5/16” (7.9mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626.

I. Carriage bolts and nuts: Galvanized of commercial quality.

2.5 CONCRETE FOOTINGS

A. Shall be 4,000 psi as specified in Section 321301.

3.0 PART 3 - EXECUTION

3.1 SITE EXAMINATION AND PREPARATION

A. Ensure property lines and legal boundaries of work are clearly established.

B. Survey of fence location to be provided by Site Contractor.

C. Clearing: The Site Contractor shall clear, grub and remove vegetation/debris for the fence installation area.

D. Verify areas to receive fencing are completed to final grade with finished elevations shown on the drawings.

3.2 CHAIN LINK FRAMEWORK INSTALLATION

A. Install chain link fence system in accordance with ASTM F567, manufacturer's instructions, and Chain Link Fence Manufacture's Institute specifications.

B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.

C. Space line posts uniformly maximum ten (10’) feet on center.

D. Excavation: Drill holes of diameters and spacings shown, for post footings in firm, undisturbed or compacted soil.

1. Excavate hole depths as detailed when in firm, undisturbed soil. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

2. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site, as directed.

E. Setting Posts: Remove all loose and foreign materials from sides and bottoms of holes.

1. Center and align posts in holes. Install posts plumb, in neat, straight lines, and with minimal waviness of top railing.

2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

3. Trowel finish tops of footings, and dome surface to direct water away from posts. Extend footings for posts as detailed.

4. Keep exposed concrete surfaces moist for at least 7 days after placement, or cure with curing material, or other acceptable method.

F. Concrete Strength: Allow concrete to attain at least 75% of its minimum 28-day compressive strength, but in no case sooner than 7 days after placement, before rails, tension bands or fabric is installed. Do not stretch and tension fabric and wires until the concrete has attained its full design strength.

G. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

H. Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6’ and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.

I. Top rail: Install in lengths of 21’. Connect ends with sleeves forming a rigid connection, allow for expansion and contraction.

J. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps. A center rail is required for fabric height 8'-0" and over.

K. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.

L. Fasteners: Peen ends of bolts or score threads to prevent removal of nuts.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on security side or play side for athletic facilities as directed by the Architect, pull fabric taut; thread the tension bar through fabric and attach to terminal

posts with tension bands spaced maximum of 15” on center and attach so that fabric remains in tension after pulling force is released. Install fabric so that it is above finish grade as detailed.

B. Secure fabric using wire ties to line posts at 12" on center and to rails and braces 12" on center. Tie wire shall be secured to the fabric by wrapping it two (2), 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude so as to avoid injury if a pedestrian may come in contact with the fence.

3.4 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as chain link fence installation is completed, clear the site of all extraneous concrete, gravel, fence material or debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 323101

SECTION 323301 - MODULAR DUGOUTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide two (2) modular 8’W x 36’L dugouts as shown on the drawings.

B. Provide material, labor and equipment required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321301 - Site Concrete Work

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. National Federation of State High School Associations (NFHS)
4. American Sports Builders Association (ASBA)
5. Manufacturers Data and Recommended Installation Requirements

1.4 SUBMITTALS

A. Provide Manufacturer's Product Data (MPD) including:

1. Modular Dugouts
2. Stand-Up Cubby (Helmet and Bat Storage System)
3. Dugout Shelving
4. Doors/Frames/Hardware

B. Shop Drawings:

1. Provide complete details and schedule for fabrication and assembly of dugout including structural members, wall sections, concrete footings, procedures and diagrams.
2. Provide fabrications and installation layouts of metal panels, details of edge conditions, panel profiles, corners, anchorages, attachment system, trip, flashings, closures and accessories, and special details.
3. Accessories: Include detail of the flashing, trim, and anchorage systems.
4. Shop drawings shall be stamped by a licensed NYS PE.

C. Samples: Color samples for all products, siding, roofing, etc.

D. Product Teat Reports: For each product, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.6 WARRANTY

Limited 3 Years on Material and Workmanship from Date of Delivery.

1.7 PRODUCT DELIVERY AND STORAGE

Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.1 MODULAR ENCLOSED DUGOUTS

A. BASE: ED8X36 - Enclosed Dugout 8'W x 36'L as Manufactured and Supplied by: Sportsfield Specialties, Inc., P.O. Box 231, 41155 State Highway 10, Delhi, NY 13753 p. 607-746-1460, www.sportsfieldspecialties.com

B. DESIGN CRITERIA:

1. Building Code: ASCE 7-10
2. Maximum Wind Speed Rating: 140mph, Exposure Category C
3. Maximum Ground Snow Load: 60psf
4. Seismic Design: Category E, Ss=1.5g, S1=0.75g
5. Roof Pitch: 2" Rise Back-to-Front

C. COMPONENTS:

1. Enclosed Dugout:
   a. Overall Dimensions: 8'-1"W x 36'L
   b. Wall Frames Fabricated of:
      i. 3-1/2" x 3-1/2" x 3/16" (0.1875") Structural Steel Tube, Fully Welded Construction
      ii. Vertical Columns Include Factory Pre-Drilled 8-1/4" x 8" x 5/8" (0.625") A36 Steel Base Mounting Plates
         1. Maximum Allowable Spacing Between Rear Columns is Eight Feet (8') On-Center
         2. Maximum Allowable Spacing Between Front Columns is Sixteen Feet (16') On-Center
      iii. 18 Gauge Galvanized Steel Track and Studs, 16" On-Center (In Wall)
   c. Roof Frame Fabricated of:

i. 3-1/2” x 3-1/2” x 3/16” (0.1875”) Structural Steel Perimeter and Transverse Roof Tubes, and 3” x 2” x 11 Gauge Structural Steel Longitudinal Roof Tubes
ii. Fully Welded Construction

d. Structural Steel Wall and Roof Frame Receives a Powder Coated Primer and Coated Finish, Various Standard and Custom Colors Available
e. Roofing Material is 29 Gauge, Classic Rib® Style Corrugated Metal with J-Channel Drip Cap Installed on Front and Sides, Various Standard Paint Finish Colors Available
f. Exterior Siding:
i. Standard SmartSide® Lap Siding (Metal Siding Available Upon Request)
ii. Installed over OSB Sheathing and Housewrap
g. Finished Interior Walls:
i. Interior Walls Covered with a Minimum Thickness of 1/2” (0.5”) Medium Density Overlay (MDO) Fir Plywood Manufactured with 100% Waterproof Adhesives and Coated with Resin Treated Fiber Overlay that Provides Smooth Painting Surface, Seams Sealed with Caulk and Covered with Wood Batten Trim Strips
ii. Interior Wall Surface and Wood Trim Hand Spackled, Sanded and Sealed with Exterior Grade Primer and Paint Finish
h. Includes Carbon Steel Anchoring Hardware, Epoxy and Lifting Eye Bolts

2. Stamped and Sealed Drawings and Calculations by a Licensed Professional Engineer of Record in the State of Project Location
3. Storage Closet (Size: 6’ x 8’)
a. Fully Integrated with Enclosed Dugout
b. Includes One (1) 3'W x 6'-8”H Galvannealed 18 Gauge Steel Hollow Door with Honeycomb Flush Core, Galvannealed 16 Gauge Steel Door Frame, Three (3) Stainless Steel Hinges, One (1) Lever Handle and Lockset, One (1) Door Sweep, One (1) Closer, One (1) Threshold and One (1) Weatherstrip, Door and Door Frame Receive a Powder Coated Primer and Finish
c. Interior Walls Finished with Primed 7/16” Oriented Strand Board (OSB) Panels Attached 18 Gauge Flange Steel Studs
d. Interior/Exterior Lighting, Electrical Outlets, Windows, Fully Finished Interior, and Scorer’s Counter Available Upon Request
4. Standard Electrical Package Includes Three (3) Overhead Lights Two (2) Light Switches Three (3) Dual Outlet Receptacles and One (1) Junction Box for Electrical Supply Connection By Others

2.2 CONCRETE PAD AND FOOTINGS

A. Per Section 321301.

2.3 STAND-UP CUBBY

A. Components:
1. Stand-Up Cubby Unit Constructed of heavy duty aluminum.
a. Powdercoat finish as selected by the Owner.
b. Helmet storage units shall be 10-3/4” square x 18” deep x 16 in quantity.
c. Front bat bin storage shall be 10-3/8” square x 8 in quantity.

d. Overall unit size shall be 7’-5-5/16” x 3’-5/16” x 4’-0”.
e. Provide vinyl covers for each unit. Colors by Owner.
f. Provide one (1) unit per dugout.
g. Add keyed locks to lower cabinet doors with recessed pull handle.

B. Standard of Quality shall be: SUAHCBBSS as manufactured by Sportsfield Specialties, Inc. or Architect approved equal.

2.4 DUGOUT SHELVING

A. Overhead Storage Shelf

1. Overhead Storage Shelf and Accessories:
a. Constructed of heavy duty aluminum.
b. Nominal sizes is 1-1-1/16” x 1-4-1/16” x 4’-0”
c. Powdercoat finish as selected by the Owner.
d. Hat and cook hooks, four per unit.
e. Provide six (6) shelf units per dugout.

B. Standard of quality shall be LG-CR-WL as manufactured by Sportsfield Specialties, Inc., or Architect approved equal.

PART 3 - EXECUTION

3.1 MODULAR ENCLOSED DUGOUTS

A. All Dugouts shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings. Concrete anchoring to be as determined by manufacturer’s licensed NYS PE and based on local soil conditions and building codes. Installer should have a minimum of five (5) Dugout installations or similar experience in the previous three (3) years.

3.2 STAND-UP CUBBY

A. Install permanently and as recommended by the manufacturer.

3.5 DUGOUT SHELVING

A. Install permanently and as recommended by the manufacturer.

3.6 CLEAN UP

A. During the contract and at intervals as directed by the Architect work is completed, clear the site of extraneous appurtenances and debris. Leave the site in a clean, safe, well-draining, neat condition.

END OF SECTION 323301

SECTION 329201 - SEEDED LAWNS

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the lawn work is shown on the drawings. The lawn work limits equal the Contract Limit Line except as noted on the drawings. Non-paved, non-roofed areas within the Contract Limit Line shall receive four (4") inches settled depth of topsoil and lawn seed. Existing lawn areas that are not disturbed require no additional work. Lawn types as shown on the drawings are defined as follows:

1. Lawn Type 1: Strip and stockpile 4" topsoil, remove debris, replace 4" topsoil, seed, and mulch.
2. Lawn Type 2: Strip, stockpile 4" topsoil, remove debris, replace 4" topsoil, seed and straw mat.

B. Lawn work includes, but is not limited to, the following:

1. Placing and spreading stockpiled topsoil
2. Importing, placing and spreading topsoil
3. Seed bed preparation
4. Seeding lawns
5. Mulching and fertilizing
6. Straw mat stabilization
7. Maintenance: See watering, mowing, fertilizing, core aerating, weed control, grow in and other specific requirements.
8. Clean Up

C. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation (Topsoil Stripping)

B. Section 312201 - Site Earthwork

1.3 REFERENCES

A. ASTM D4972 - Standard Test Method for pH of Soils

B. ASTM D5268 - Standard Specification for Topsoil Used for Landscaping Purposes

C. ASTM D422 and D1140 - Standard Test Method for Particle Size Analysis of Soils

D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effect

E. ASTM F1647 - Standard Test Method for Organic Material Content of Athletic Field Rootzone Mixes.

F. ASTM F1632 - Standard Test Method for Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sportsfield Rootzone Mixes

G. ASTM F2060 - Standard Guide for Maintaining Cool Season Turfgrasses on Athletic Fields

H. National Turfgrass Federation, Inc.

I. National Turfgrass Evaluation Program (NTEP).

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Furnish name of Landscape Contractor or Nurseryman to perform lawn work and a list of completed projects including contact information for each project demonstrating compliance with applicable qualification requirements outlined in 1.5 "Quality Assurance" of this specification section.

B. Provide Material Certificates and MPD for:

1. Seed species and source
2. Limestone
3. Fertilizers
4. Hydromulch
5. Straw mat - MPD only
6. Straw (dry mulch) - location of straw producer

C. Provide Topsoil Test Report (for Onsite and Imported Topsoil): Submit test results from Architect approved independent testing laboratory on their letterhead. Report shall:

1. Certify soil texture, organic content, and particle size analysis.
2. Chemical analysis testing nitrogen, phosphorus, potassium, calcium, magnesium, cation exchange capacity, base saturation percentages, micronutrients and acidity (pH).
3. Provide timing and rates of soil additives, liming and fertilizers. (Materials and procedures regarding soil amendments and fertilizers specified in this section are approximate.) Adjust all soil amendments to comply with test results based on actual soil tests and as directed by the Architect at no additional cost to the Owner.

D. Provide letter on Contractor’s letterhead certifying that only topsoil from the above tested source was used on the project.

E. Lawn Seed Mix: Submit one (1 lb.) pound seed sample for each mix specified in supplier's unopened package with supplier's certification statement clearly showing the following:

1. Name and address of labeler
2. Lot number
3. Kind and variety of turfgrass seed listed in order of predominance
4. Percent by weight of pure seed of each species and variety (percent purity)

5. Germination percentage (percent viable seed)
6. Percent by weight of other crop seed
7. Percent by weight of weed seed
8. Percent undesirable grass seed
9. Percent by weight of inert matter
10. Date on which the germination test was conducted

F. Submit seed tags from **ALL** used or partially used seed bags. At times throughout the project, the Architect may request seed samples of onsite seed bags.

G. Provide schedule for review and approval as outlined under "Sequence and Scheduling" of this specification section.

1.5 QUALITY ASSURANCE

A. General Lawn Contractor: Work shall be contracted to a single, established Landscape Contracting or Nursery firm having sufficiently experienced crews, supervisor(s), specialized equipment, and an excellent record of performance on completed lawn projects of comparable size, scope, and quality. Provide expert turfman to direct the work in the field on a regular, daily basis. The expert turfman shall be employed by the same company engaged in the installation of the lawn work for a minimum of five (5) years.

B. Nomenclature: Seed names shall conform to the National Turfgrass Federation, Inc.

C. Seed Quality Rating: Shall meet testing standard for New York State outlined by the National Turfgrass Evaluation Program (NTEP).

D. Testing: If required by the Architect for poor lawn grow in, engage an Architect approved independent, qualified New York State testing service and turfgrass specialist to evaluate Contractor grow in practices and materials used. Pay for all testing/inspection services, materials, and manpower to correct lawn areas as approved by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed:

1. Packing and Shipping: Ship seed and associated materials with certificates of inspections required by governing authorities.

2. Do not make substitutions. If specified seed material is not obtainable, submit to the Architect proof of non-availability and a proposal for use of equivalent material with similar performance criteria as the originally specified seed material.

3. Store all seed at the site in a cool, dry place in a manner to prevent wetting and deterioration, as approved by the Architect. Replace any seed damaged during storage as directed by the Architect.

4. Deliver seed in supplier's unopened packages bearing labels showing the supplier's name and seed analysis by weight.

B. Fertilizer:

1. Deliver fertilizer in the manufacturer's standard sized bags showing the weight, analysis, and manufacturer's name. Store all fertilizer under a waterproof cover or in a dry place as approved by the Architect.

1.7 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Lawn Work:

1. Perform lawn work after planting, fine grading and other work affecting the ground surfaces in the lawn work areas has been completed satisfactorily.

2. Where practical, the Owner will provide a connection to the water system such as, but not limited to, existing yard hydrants, building hose bibs, etc. If this source is insufficient, not available or practical to provide a source of sufficient water to meet the requirements herein, the Contractor shall secure a water source sufficient to meet the water requirements herein such as, but not limited to, municipal hydrants, water truck, etc. at no additional cost to the Owner.

3. Contractor shall provide all watering equipment and appurtenances such as, but not limited to, meters, backflow preventer, labor, hoses, sprinklers, irrigation and watering equipment.

4. Calendar dates for seeding under "Sequence and Scheduling" of this specification section shall apply.

5. For General Lawn Type 1 and 2, perform lawn seeding using mechanical and hand seeding methods. Hydromulching is not permitted within ten (10') feet of buildings edges.

6. Protect newly seeded lawns from vehicles, vandalism, or trespass. Provide temporary fencing or barriers as required.

C. Construction Review:

1. Upon completion of topsoil spreading and seed bed preparation, notify Architect to review work.

2. The Architect may review fine graded areas by the Contractor to check for surface smoothness and general compliance with grading requirements. Fill or cut by hand raking or other acceptable means to achieve smooth, even well-draining lawn surfaces free of "bird baths" and breaks in grade as directed by the Architect at no additional expense to the Owner.

3. Review of any fine graded lawn areas by Architect shall not alleviate the Contractor of his responsibility for conforming to the required grades as shown on the drawings, nor be misconstrued as final acceptance of lawn work.

1.8 SEQUENCING AND SCHEDULING

A. Schedule: Prior to construction, provide a schedule which addresses the following lawn thresholds involving erosion control stabilization:

1. Seeding Installation: The Contractor may invoice for 50% of the approved schedule of value breakdown at the time of acceptable installation.

a. Unless otherwise directed in writing by the Architect, seed lawns from April 1 to May 15, and from August 15 to October 1. Seeding between May 16 and August 14 is not acceptable unless adequate water supply is available and applied to the turfgrass as required herein and approved by the Architect.
b. Proceed with and complete seeding as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.

2. Substantial Completion: The Contractor may invoice for 25% of the approved schedule of value breakdown at the time of substantial completion as described in Part 3, "Standards For Substantial Completion Of Lawns" of this specification section. At this time, the Architect may issue the Notice of Termination to satisfy the NYS DEC stabilization requirements. The date of substantial completion is anticipated approximately 60 days after lawn installation presuming all Contractor maintenance operations have been vigorously performed.

3. Final Acceptance: The Contractor may invoice for the final 25% of the approved schedule of value breakdown at the time of final acceptance as described in Part 3, "Standards For Final Acceptance Of Lawns" of this specification section. The date of final acceptance is anticipated approximately 30 days after substantial completion presuming all Contractor maintenance operations have been vigorously performed.

4. Owner Maintenance: After final acceptance of the lawns, the Owner will maintain for 1 to 3 growing seasons to reach competitive maturity and beyond per ASTM F2060.

2.0 PART 2 - PRODUCTS

2.1 TOPSOIL

A. Source: Provide from off site, Architect approved source, when stripped, stockpiled and amended quantity is inadequate to provide four (4") inches settled depth of topsoil for all lawn areas at no additional cost to the Owner.

B. Texture and Content: Provide topsoil conforming to the following:

1. Soil texture and content:

a. Sandy loam topsoil, well drained homogeneous texture and of uniform grade, without the admixture of subsoil material. Topsoil shall be entirely free of dense material, hardpan, clay, stones over 3/4" in diameter, sod, or any other objectionable foreign material, including but not limited to, glass, debris, toxins, hazardous wastes and chemicals (such as atrizene or muriatic acid within the past seven (7) years) that may be injurious to humans, animals and plant materials.

b. Organic Matter: Containing not less than 5% or more than 10% organic matter in that portion of a sample passing a 1/4" sieve when determined by the wet combustion method on a sample dried at 105 degrees F.

2. pH Value: Containing a pH value within the range of 6.0 to 7.0 on that portion of the sample which passes a 1/4" sieve.

3. Soluble salt content: Not higher than 500 parts per million.

4. Sieve Analysis for general lawn work: Shall be screened or rock picked to meet the following gradation:

Sieve Designation	% Passing
3/4"	100
1/4"	97-100
No. 200	20-65 (of the 1/4" sieve)

C. No lawn shall be seeded on topsoil that has been chemically treated until sufficient time has elapsed to permit dissipation of all toxic materials. The Contractor shall assume full responsibility for any loss, damage, or the inability to grow a sufficient stand of grass from seed, as indicated herein, arising from improper use of chemicals or due to failure to allow sufficient time to permit dissipation of toxic residues, whether or not such materials are specified herein.

2.2 LAWN SEED MIX

A. Provide fresh, clean, new-crop seed mixed in the proportions specified for species and variety, and conforming to Federal, State, latest American Association of Nurseryman (AAN) Standards and National Turf Evaluation Program (NTEP).

B. Acceptable material in a seed mixture other than pure live seed consists of nonviable seed, chaff, hulls, live seed of crop plants and inert matter. The percentage of weed seed shall not exceed 0.05% by weight.

C. All seed must by fresh seed. Seed that is left over from the previous year and beyond sell by date is not acceptable.

D. Grass seed shall be certified "Blue Tag" seed composed of a blend of varieties mixed in proportion by weight and tested for minimum percentages of purity and germination. Submit the proposed mixture to the Architect for approval.

E. Provide the following lawn seed mix:

1. General Lawn Type 1 and 2:

Amount by Weight	Species or Variety	Purity	Percentage Germination
40% (Min.)	Kentucky Bluegrass Blend*	95%	85%
35% (Max.)	Fine Textured Endophytic Perennial Rye**	98%	90%
25% (Min.)	Creeping Red Fescue***	97%	85%
100%			

* Kentucky Bluegrass Blend shall contain no more than 25% of any one cultivar and always at least two (2) different cultivars. Acceptable cultivars: Rambo, Princeton-105, Wildwood, Allure, Coventry, Champagne, Northstar, Cardiff, Nimbus, Raven, SR2100, Misty, America, Brilliant, Limousine, Conni, Liberator, Apollo, NuGlade, Total, Eclipse, Unique, Impact, Midnight, Arcadia, and Serene or Architect approved equal.

** Perennial Rye Blend shall contain no more 30% of any one (1) cultivar and always at least three (3) different cultivars. Acceptable cultivars: Palmer III, Calypso II, Brightstar II, Secretariat, Monterey, Catalina, Pennant II, Premier II, Sonata, Sunshine and Ascend or Architect approved equal.

*** SR5000 is acceptable.

2. Overseeding: Seed blend shall consist of 100% Perennial Ryegrass with at least three (3) cultivars. Acceptable Perennial Ryegrass cultivars include the following: Palmer III, Calypso II, Brighstar II, Secretariat, Monterey, Catalina, Pennant II, Premier II, Sonata, Sunshine, and Ascend. The Perennial Ryegrass shall have a minimum germination percentage of 90%. The percentage of weed seed shall not exceed 0.05% and other crop seed shall not exceed 0.5% by weight of the mixture.

F. Acceptable Seed Suppliers:

United Agri Products
Steve Hyde (315) 383-5035;

Matrix Turf Solutions
Jerry Clark (315) 480-7340;

Lesco, Inc.
Will Abel (315) 437-3423;

Preferred Seed
Jack Bryant (716) 895-7333;

Or Architect approved equal.

2.3 LIMESTONE

A. Shall be ground limestone in the producer's standard bags containing not less than 85% total carbonates and conforming to the following gradations:

Sieve Designation	% Passing
No. 100	50-100
No. 20	100

B. The lime shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use will be rejected.

2.4 TACKIFIER FOR SEEDED LAWNS

A. Shall be liquid concentrate diluted with drinkable water forming a transparent three-dimensional film-like crust permeable to water and air, containing no agents toxic to seed germination to hold straw mulch in place.

B. Standard of quality shall be Terra Tack or Architect approved equal.

2.5 FERTILIZER

A. For Starter Fertilization: Immediately prior to seeding, fertilize with a commercial starter fertilizer, granular, non-burning product, with not less than 90% organic slow acting, micro nutrients and 1% iron, guaranteed analysis commercial fertilizer. Fertilizer ratio shall be: (1-2-1). Apply at a rate of 0.33 - 0.66 lbs of nitrogen (N) per 1,000 sf.

B. For Subsequent and Final Fertilizations: Apply commercial fertilizer, poly coated granular non-burning product with not less than 90% organic slow acting, guaranteed analysis

1. For Spring and Fall Lawn Work: Fertilizer ratio shall be: (3-0-1). Apply at rate of 1.5 - 2 lbs nitrogen (N)/1,000 s.f.

2.6 STRAW MAT FOR SEEDED LAWNS

See Specification Section 312501.

2.7 MULCH FOR SEEDED LAWNS

A. Dry Application Straw: Shall be straw consisting of clean stalks of oats, wheat, rye or other approved crops well seasoned before baling which are free of noxious weed seeds and roots. Weight shall be based on 15% moisture.

B. Hydro Applications: Shall be hydromulch containing 100% wood fiber mulch. Standard of quality shall be Mat Fiber as manufactured by Mat, Inc. and distributed by Matrix Turf Solutions, (315) 468-6000 or Architect approved equal.

2.8 WATER: Free of substance harmful to lawn, other plants, humans and animals.

3.0 PART 3 - EXECUTION

3.1 INSPECTION

A. Verify limits of lawn and other types of ground cover materials in the field with drawings. Also any imported and screened topsoil areas. Notify Architect of discrepancies prior to proceeding with lawn work.

B. Examine finish surfaces, grade, topsoil quality, and depth.

C. Do not start lawn work until unsatisfactory conditions are corrected to the satisfaction of the Architect.

3.2 SPREAD TOPSOIL

A. Limit preparation to areas which will be immediately seeded.

B. Perform topsoil spreading operations only during dry weather.

C. To insure a proper bond with the topsoil, disc, harrow, or otherwise scarify and loosen the lawn subgrade to a depth of four (4") inches before spreading topsoil.

D. Spread topsoil to ensure a minimum settled depth of four (4") inches in lawn areas.

3.3 PREPARE GENERAL LAWN AREAS TYPE 1 AND 2

A. Perform a pH test, sieve, and nutrient analysis of the topsoil and advise the results to the Architect prior to adding limestone or other soil amendments. Soil amendments shall be uniformly incorporated into the top four (4") inches of topsoil by discing, harrowing or other approved methods.

B. Remove debris and stones 3/4" or larger by handpicking, fine tooth aluminum grading rakes, and mechanized stone picker. When topsoil has hardened, cultivate soil to a four (4") inch depth by plowing, discing, harrowing, or otherwise scarifying and loosening the topsoil.

C. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Scarify, rake, level, and roll with a light static roller as necessary to obtain true, even lawn surfaces and fill depressions as required to drain. Correct irregularities in the surface resulting from tillage operations to prevent formation of depressions or water pockets.

D. Cultivate soil to provide a firm bed of minimum of four (4") inches deep, free of clods, stones, or foreign matter over 3/4" in diameter from the top of soil. Do not move heavy objects except necessary lawn making equipment over the lawn areas after the soil is prepared unless it is again loosened and graded. Remove stones and all debris greater than one 3/4" in diameter during cultivation. Level undulations and irregularities in the surface.

E. For pH correction provide adjusted rate of application as recommended in Topsoil Test Report submittal. For low pH correction: Add ground limestone at the rate indicated by the soil test. For high pH correction: Materials and application rates shall be determined by appropriate soil tests.

F. Place starter fertilizer at the rate of 0.33 - 0.66 lbs. of nitrogen (N) per 1,000 sf. and mix into full depth of topsoil.

G. Rake area with fine toothed aluminum grading rake before placing seed to obtain a smooth surface at the proper elevation. Drag area with a wood float to level out minor humps and hollows. Beds shall have a smooth friable uniform surface, free of areas ponding water.

3.4 LAWN SEEDING

A. Notify Architect when seed bed is ready for review as specified in Job Conditions. Obtain Architect's approval of finish grade prior to seeding.

B. Seed lawns immediately after preparation of bed and Architect's approval.

C. For General Lawn Type 1 and 2:

1. Seed at the rate of 6 lbs. per 1,000 S.F.

2. Seeding shall be performed as follows: ½ rate and mechanically incorporated into the top ½" of topsoil. The remaining ½ rate shall be mechanically spread at 90 degrees to the first application and lightly rolled.

3.5 MULCHING SEEDED AREAS

A. Mulch immediately after seeding.

B. Dry Mulch Application: Place mulch by hand or by machine at a rate of one bale/1,000 s.f. to produce a light even mulch cover so that 50% of soil is visible through the mulch layer.

C. Hydro Application: Place hydromulch by machine at a rate of one bale/1,000 sq. ft. to produce a light even mulch cover so that 50% of soil is visible through the mulch layer. NOTE: Seeding with a hydroseeder is NOT acceptable.

D. Anchor mulch by thorough heavy coat of tackifier over entire area and watering.

E. Protect seed bed from washout, wind erosion, rutting and drying out. Do not use machinery that leaves ruts in the seed bed. It is the Contractor's responsibility to add or remove mulch as needed to encourage optimum seed germination and growth.

3.6 INSTALL STRAW MAT

Install as specified in Section 312501, Part 3.

3.7 MAINTENANCE

A. Maintenance by Contractor begins as soon as lawns are seeded. Protect lawns from drought, washout and wind erosion. In general, maintain new installed lawn areas, including watering, fertilizing, core aerating, spot weeding, overseeding, mowing, applications of herbicides, fungicides, and insecticides until a full, uniform, healthy,

vigorous stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Architect. Specifically:

1. Watering Seeded Lawns:

   a. First Week: In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week to maintain moist soil to promptly germinate the lawn seed, preventing it from drying out, and keeping it in a healthy, growing condition until final acceptance. Lawn areas shall receive a minimum of one (1") of water per week, by natural rainfall, irrigation or a combination of both. Water daily until 2nd mowing (just enough water to keep the top ½" of soil moist, 1 time daily).

2. Second and Subsequent Weeks: Contractor shall provide water to the lawns as required to maintain adequate moisture, in the upper four (4") inches of soil, necessary for the promotion of deep root growth until final acceptance. After 2nd mowing, water two (2) times weekly until thoroughly established.

3. Protect: Protect lawn areas against trespass, vandalism and routine pedestrian traffic and Owner maintenance traffic by temporary fencing or other means.

4. Repair: Repair, rework, and overseed (as originally specified for that area) areas that have washed out, eroded, do not germinate and are vandalized or otherwise damaged. Overseeding rates are to be adjusted to 6 lbs. of seed per 1,000 s.f.

5. Mow: Initial mowing shall begin when the blade height reaches 2" and the soil will bear the weight of the lawn mower. Use mowers with low impact tires. For the first 3 mowings cut the grass blades to 1.5 inches. After that mow the grass when it reaches a height of about 3.5" to a height of about 2.5". Never remove more than 1/3 of the grass blade at any one mowing. A minimum of eight (8) to ten (10) mowings are required (approximately once per week after the initial germination period to final acceptance). Notify the Architect of dates in writing as mowing is performed. Excess clippings shall be carefully raked so as not to remove healthy grasses, and removed.

6. Core Aerating: Between mowings three (3) and four (4), and between mowings seven (7) and eight (8) core aerate lawns about three (3") inches on center minimum three (3") inches deep to ensure aggressive root growth. This will require multiple passes at different directions to achieve 16 to 20 holes 3/4" to 1" diameter per square foot. Sweep scattered plugs off paved areas onto adjacent lawn areas. Pulverize plugs during subsequent mowing operations. Provide additional core aerating after the 10th mowing as directed by the Architect to expedite the lawn maturation process. Moisten field by thoroughly watering the topsoil profile, several days in advance of coring to facilitate proper penetration of the topsoil.

7. Fertilizer: Immediately after core aerating, between mowings three (3) and four(4), and between mowing seven (7) and eight (8) apply subsequent fertilizer at the rate of 1.5-2 lbs./1,000 s.f. Provide additional fertilizer after the 10th

mowing as directed by the Architect to expedite the lawn maturation process. Apply a final fertilizer just prior to final acceptance at the same application rate.

8. Weed Control: When infestation of weeds or crabgrass develops, treat infestation by hand weeding or herbicides control appropriate to the area. Furnish and install weed chemical control as recommended by manufacturer. Herbicides controls must be acceptable to the Owner. Obtain and pay for permits. Use as directed by the manufacturer and applicable laws, codes, ordinances and regulatory requirements. Under NO circumstances is it acceptable to seed or overseed over Nutsedge, Crabgrass or other grassy/broadleaf weeds.

B. Maintenance by the Contractor continues through the certificate of substantial completion to final acceptance by the Architect as described below. Maintenance by Owner begins after final acceptance of the lawn.

3.8 STANDARDS FOR SUBSTANTIAL COMPLETION OF LAWNS: Review to determine substantial completion of lawns will be made by the Architect, upon request. Provide notification at least five (5) working days before requested review date.

A. Lawn areas will be substantially complete provided requirements, including maintenance, have been complied with. A healthy, vigorous, uniform, partially mature stand of lawn is established free of weeds, undesirable grass species, disease, and insects. With proper watering and maintenance as indicated herein, this should culminate after an approximate 60-72 day period for initial germination with average temperatures above 40°F. Grass roots shall have matured to a minimum of 1½" depth as determined by the Architect when core samples are taken.

B. Lawn areas shall not have more than 10% dead/bare spots.

C. Contractor shall provide a written copy of all maintenance activities performed up to this date.

D. The architect will prepare a written punch list of items which need correction prior to final acceptance.

3.9 STANDARDS FOR FINAL ACCEPTANCE OF LAWNS: Review to determine final acceptance of lawns will be made by the Architect, upon request. Provide notification at least five (5) working days before requested review date.

A. Lawn areas will be acceptable provided requirements, including maintenance, have been complied with. A healthy, vigorous, uniform, full stand of lawn is established free of weeds, undesirable grass species, disease, and insects. Grass roots shall have matured to a minimum of 2" depth as determined by the Architect when core samples are taken.

B. Any lawn which contains disease, more than 1% dead/bare spots, or any dead/bare area greater than one (1) square foot shall be rejected and the unacceptable area(s) repaired as originally specified at no additional cost to the Owner.

C. In the event the Contractor fails to complete the punch list items within a 30 day period with average temperatures of 40°F after the time of Substantial Completion, the

Contractor shall be liable to the Owner for any additional costs including those charged by the Architect.

D. Contractor shall provide a written copy of all maintenance activities performed during the contract up to final acceptance of lawns.

3.10 CLEAN UP

During the contract and at intervals as directed by the Architect and as lawn work is completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, neat, well-draining condition.

END OF SECTION 329201

SECTION 329202 - VEGETATED GROUND COVER

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the vegetated ground cover work is shown on the drawings. The work limits equal the Contract Limit Line except as noted on the drawings. Vegetated ground cover types as shown on the drawings are defined as follows:

1. Ground Cover: Strip and stockpile 4" topsoil, remove debris, replace 4" topsoil, seed, and straw mat.

B. Vegetative Ground Cover work includes, but is not limited to, the following:

1. Placing and spreading stockpiled topsoil
2. Importing, placing and spreading topsoil
3. Seed bed preparation
4. Seeding vegetated ground cover areas
5. Mulching and fertilizing
6. Maintenance: See watering, fertilizing, weed control, grow in and other specific requirements.
7. Clean Up

C. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation (Topsoil Stripping)

B. Section 312201 - Site Earthwork

C. Section 329201 - Seeded Lawns

1.3 REFERENCES

A. ASTM D4972 - Standard Test Method for pH of Soils

B. ASTM D5268 - Standard Specification for Topsoil Used for Landscaping Purposes

C. ASTM D422 and D1140 - Standard Test Method for Particle Size Analysis of Soils

D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effect

E. Ernst Seeds Establishment Guide, latest edition.

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Furnish name of Landscape Contractor or Nurseryman to perform lawn work and a list of completed projects including contact information for each project demonstrating compliance with applicable qualification requirements outlined in 1.5 "Quality Assurance" of this specification section.

B. Provide Material Certificates and MPD for:

1. Seed mix species and source
2. Limestone
3. Fertilizers
4. Hydromulch
5. Straw (dry mulch) - location of straw producer

C. Provide Topsoil Test Report (for Onsite and Imported Topsoil): Submit test results from Architect approved independent testing laboratory on their letterhead. Report shall:

1. Certify soil texture, organic content, and particle size analysis.
2. Chemical analysis testing nitrogen, phosphorus, potassium, calcium, magnesium, cation exchange capacity, base saturation percentages, micronutrients and acidity (pH).
3. Provide timing and rates of soil additives, liming and fertilizers. (Materials and procedures regarding soil amendments and fertilizers specified in this section and approximate) adjust all soil amendments to comply with test results based on actual soil tests and as directed by the Architect at no additional cost to the Owner.

D. Provide letter on Contractor’s letterhead certifying that only topsoil from the above tested source was used on the project.

E. Vegetative Ground Cover Seed Mixes: Submit three (3 oz.) ounce seed samples for each mix specified in supplier's unopened package with supplier's certification statement clearly showing the following:

1. Name and address of labeler
2. Lot number
3. Kind and variety of vegetative seed listed in order of predominance
4. Percent by weight of pure seed of each species and variety (percent purity)
5. Germination percentage (percent viable seed)
6. Percent by weight of other crop seed
7. Percent by weight of weed seed
8. Percent undesirable grass seed
9. Percent by weight of inert matter
10. Date on which the germination test was conducted

F. Submit seed tags from **ALL** used or partially used seed bags. At times throughout the project, the Architect may request seed samples of onsite seed bags.

G. Provide schedule for review and approval as outlined under "Sequence and Scheduling" of this specification section.

1.5 QUALITY ASSURANCE

A. Vegetative Ground Cover Contractor: Work shall be contracted to a single, established Landscape Contracting or Nursery firm having sufficiently experienced crews, supervisor(s), specialized equipment, and an excellent record of performance on completed vegetative ground cover projects of comparable size, scope, and quality. Provide expert turfman to direct the work in the field on a regular, daily basis. The expert turfman shall be employed by the same company engaged in the installation of the vegetative ground cover work for a minimum of three (3) years.

B. Nomenclature: Seed names shall conform to the latest edition of U.S.D.A., Natural Resources Conservation Services Plant Database.

C. Testing: If required by the Architect for poor lawn grow in, engage an Architect approved independent, qualified New York State testing service and turfgrass specialist to evaluate Contractor grow in practices and materials used. Pay for all testing/inspection services, materials, and manpower to correct lawn areas as approved by the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed:

1. Packing and Shipping: Ship seed and associated materials with certificates of inspections required by governing authorities.

2. Do not make substitutions. If specified seed material is not obtainable, submit to the Architect proof of non-availability and a proposal for use of equivalent material.

3. Store all seed at the site in a cool, dry place in a manner to prevent wetting and deterioration, as approved by the Architect. Replace any seed damaged during storage as directed by the Architect.

4. Deliver seed in supplier's unopened packages bearing labels showing the supplier's name and seed analysis by weight.

B. Fertilizer:

1. Deliver fertilizer in the manufacturer's standard sized bags showing the weight, analysis, and manufacturer's name. Store all fertilizer under a waterproof cover or in a dry place as approved by the Architect.

1.7 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Vegetative Ground Cover Work:

1. Perform lawn work after planting, fine grading and other work affecting the ground surfaces in the vegetative ground cover work areas has been completed satisfactorily.

2. Provide water, meters, backflow preventer, labor, hoses, sprinklers, irrigation and watering equipment. The Owner will pay for the water usage including trucking if required.

3. Calendar dates for vegetative ground cover under "Sequence and Scheduling" of this specification section shall apply.

4. Place sod only when ground surface is free of mud, frost, snow and ice.

5. Perform vegetative ground cover seeding using mechanical and hand seeding methods.

C. Construction Review:

1. Upon completion of topsoil spreading and seed bed preparation, notify Architect to review work.

2. The Architect may review fine graded areas by the Contractor to check for surface smoothness and general compliance with grading requirements. Fill or cut by hand raking or other acceptable means to achieve smooth, even well-draining lawn surfaces free of "bird baths" and breaks in grade as directed by the Architect at no additional expense to the Owner.

3. Review of any fine graded vegetative ground cover areas by Architect shall not alleviate the Contractor of his responsibility for conforming to the required grades as shown on the drawings, nor be misconstrued as final acceptance of lawn work.

1.8 SEQUENCING AND SCHEDULING

A. Schedule: Prior to construction, provide a schedule which addresses the following vegetative ground cover thresholds involving erosion control stabilization and proper establishment:

1. Vegetative Ground Cover Installation: The Contractor may invoice for 50% of the approved schedule of value breakdown at the time of acceptable installation.

a. Unless otherwise directed in writing by the Architect, vegetative ground cover from April 1 to May 15, and from August 15 to October 1. Seeding and sodding between May 16 and August 14 is not acceptable unless adequate water supply is available and approved by the Architect.

b. Proceed with and complete vegetative ground cover as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.

2. Final Acceptance: The Contractor may invoice for the final 50% of the approved schedule of value breakdown at the time of final acceptance as described in Part 3, "Standards For Final Acceptance Of Vegetative Ground Cover " of this specification section. The date of final acceptance is anticipated approximately 30 days after substantial completion presuming all Contractor maintenance operations have been vigorously performed.

3. Owner Maintenance: After final acceptance of the vegetative ground cover, the Owner will maintain for the life of the vegetative ground cover.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Source: Provide from off site, Architect approved source, when stripped, stockpiled and amended quantity is inadequate to provide four (4") inches settled depth of topsoil for all lawn areas at no additional cost to the Owner.

B. Texture and Content: Provide topsoil conforming to the following:

1. Soil texture and content:

a. Sandy loam topsoil, well drained homogeneous texture and of uniform grade, without the admixture of subsoil material. Topsoil shall be entirely free of dense material, hardpan, clay, stones over 3/4" in diameter, sod, or any other objectionable foreign material, including but not limited to, glass, debris, toxins, hazardous wastes and chemicals (such as atrizene or muriatic acid within the past seven (7) years) that may be injurious to humans, animals and plant materials.

b. Organic Matter: Containing not less than 5% or more than 15% organic matter in that portion of a sample passing a 1/4" sieve when determined by the wet combustion method on a sample dried at 105 degrees F.

2. pH Value: Containing a pH value within the range of 6.5 to 7.5 on that portion of the sample which passes a 1/4" sieve.

3. Soluble salt content: Not higher than 500 parts per million.

4. Sieve Analysis for vegetative ground cover work: Shall be screened or rock picked to meet the following gradation:

Sieve Designation	% Passing
3/4"	100
1/4"	97-100
No. 200	20-65 (of the 1/4" sieve)

2.2 GROUND COVER SEED MIX

A. Provide fresh, clean, new-crop seed mixed in the proportions specified for species and variety, and conforming to Federal, State, latest American Association of Nurseryman (AAN) Standards.

B. Acceptable material in a seed mixture other than pure live seed consists of nonviable seed, chaff, hulls, live seed of crop plants and inert matter. The percentage of weed seed shall not exceed 0.05% by weight.

C. All seed must by fresh seed. Seed that is left over from last year and beyond sell by date is not acceptable.

D. Ground cover seed shall be certified "Blue Tag" seed composed of a blend of varieties mixed in proportion by weight and tested for minimum percentages of purity and germination. Submit the proposed mixture to the Architect for approval.

E. Provide the following seed mix:

Amount by Weight	Species or Variety
50.00%	Coronilla varia, Penngift (Crownvetch, Penngift)
40.00%	Lolium multiflorum (Annual Ryegrass)
10.00%	Trifolium hybridum (Alsike Clover)

F. Standard of quality shall be: Crownvetch Seeding Mix (Naturalized) ERNMX-109 as prepared by Ernst Conservation Seed, (800) 873-3321, www.ernstseed.com, or Architect approved equal.

2.3 LIMESTONE

A. Shall be ground limestone in the producer's standard bags containing not less than 85% total carbonates and conforming to the following gradations:

Sieve Designation	% Passing
No. 100	50-100
No. 20	100

B. The lime shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use will be rejected.

2.4 TACKIFIER FOR VEGETATIVE GROUND COVER

A. Shall be liquid concentrate diluted with drinkable water forming a transparent three-dimensional film-like crust permeable to water and air, containing no agents toxic to seed germination to hold straw mulch in place.

B. Standard of quality shall be Terra Tack or Architect approved equal.

2.5 FERTILIZER

A. For Starter Fertilization: Immediately prior to seeding, fertilize with a commercial starter fertilizer, granular, non-burning product, with not less than 90% organic slow acting, micro nutrients and 1% iron, guaranteed analysis commercial fertilizer. Fertilizer ratio shall be: (1-2-1). Apply at a rate of 0.33 - 0.66 lbs of nitrogen (N) per 1,000 sf.

B. For Subsequent and Final Fertilizations: Apply commercial fertilizer, poly coated granular non-burning product with not less than 90% organic slow acting, guaranteed analysis

1. For Spring and Fall Lawn Work: Fertilizer ratio shall be: (3-0-1). Apply at rate of 1.5 - 2 lbs nitrogen (N)/1,000 s.f.

2.6 STRAW MAT FOR VEGETATIVE GROUND COVER

See Specification Section 312501.

2.7 MULCH FOR VEGETATIVE GROUND COVER

A. Dry Application Straw: Shall be straw consisting of clean stalks of oats, wheat, rye or other approved crops well seasoned before baling which are free of noxious weed seeds and roots. Weight shall be based on 15% moisture.

B. Hydro Applications: Shall be hydromulch containing 100% wood fiber mulch. Standard of quality shall be National Fiber as distributed by Northern Nurseries, (315) 699-3999 or Architect approved equal.

2.9 WATER: Free of substance harmful to lawn, other plants, humans and animals.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify limits of vegetative ground cover materials in the field with drawings. Also any imported and screened topsoil areas. Notify Architect of discrepancies prior to proceeding with vegetative ground cover work.

B. Examine finish surfaces, grade, topsoil quality, and depth.

C. Do not start vegetative ground cover work until unsatisfactory conditions are corrected to the satisfaction of the Architect.

3.2 SPREAD TOPSOIL

A. Limit preparation to areas which will be immediately seeded.

B. Perform topsoil spreading operations only during dry weather.

C. To insure a proper bond with the topsoil, disc, harrow, or otherwise scarify and loosen the lawn subgrade to a depth of four (4") inches before spreading topsoil.

D. Spread topsoil to ensure a minimum settled depth of four (4") inches in vegetative ground cover areas.

3.3 PREPARE VEGETATIVE GROUND COVER AREAS

A. Perform a pH test, sieve, and nutrient analysis of the topsoil and advise the results to the Architect prior to adding limestone or other soil amendments.

B. Remove debris and stones 3/4" or larger by handpicking, fine tooth aluminum grading rakes, and mechanized stone picker. When topsoil has hardened, cultivate soil to a four (4") inch depth by plowing, discing, harrowing, or otherwise scarifying and loosening the topsoil.

C. Grade vegetative ground cover areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll, scarify, rake, and level as necessary to obtain true, even vegetative ground cover surfaces and fill depressions as required to drain. Correct irregularities in the surface resulting from tillage operations to prevent formation of depressions or water pockets.

D. Cultivate soil to provide a firm bed of minimum of four (4") inches deep, free of clods, stones, or foreign matter over one (1") inch in diameter from the top of soil. Do not move heavy objects except necessary vegetative ground cover making equipment over the vegetative ground cover areas after the soil is prepared unless it is again loosened and graded. Remove stones greater than one 3/4" in diameter during cultivation. Level undulations and irregularities in the surface.

E. Provide adjusted rate of application as recommended in Topsoil Test Report submittal when rate differs from the following: Add ground limestone at the rate of 100 lbs. per 1,000 S.F. or equivalent acidifier as directed by the Architect.

F. Place starter fertilizer at the rate of 0.33 - 0.66 lbs. of nitrogen (N) per 1,000 sf. and mix into full depth of topsoil.

G. Rake area with fine toothed aluminum grading rake before placing seed to obtain a smooth surface at the proper elevation. Drag area with a wood float to level out minor humps and hollows. Beds shall have a smooth friable uniform surface, free of areas ponding water.

3.4 VEGETATIVE GROUND COVER SEEDING

A. Notify Architect when seed bed is ready for review as specified in Job Conditions. Obtain Architect's approval of finish grade prior to seeding.

B. Seed vegetative ground cover immediately after preparation of bed and Architect's approval.

C. For vegetative ground cover:

1. Seed at the rate of 20 lbs. per acre or 1/2 lb. per 1,000 S.F.

2. Seeding shall be performed as follows: 1/2 rate and mechanically incorporated into the top 1/2" of topsoil. The remaining 1/2 rate shall be mechanically spread and rolled.

3. Hydroseeding is NOT allowed for vegetative ground cover areas due to the lack of seed soil contact.

3.5 MULCHING VEGETATIVE GROUND COVER AREAS

A. Mulch immediately after seeding.

B. Dry Mulch Application: Place mulch by hand or by machine at a rate of one bale/1,000 s.f. to produce a light even mulch cover so that 50% of soil is visible through the mulch layer.

C. Hydro Application: Place hydromulch by machine at a rate of one bale/1,000 sq. ft. to produce a light even mulch cover so that 50% of soil is visible through the mulch layer. NOTE: Seeding with a hydroseeder is NOT acceptable.

D. Anchor mulch by thorough heavy coat of tackifier over entire area and watering or incorporate tackifier into hydromulch.

E. Protect seed bed from washout, wind erosion, rutting and drying out. Do not use machinery that leaves ruts in the seed bed. It is the Contractor's responsibility to add or remove mulch as needed to encourage optimum seed germination and growth.

3.6 INSTALL STRAW MAT

Install as specified in Section 312501, Part 3.

3.7 MAINTENANCE

A. Maintenance by Contractor begins as soon as vegetative ground cover areas are seeded. Protect vegetative ground cover from drought, washout and wind erosion. In general, maintain new installed vegetative ground cover areas, including watering, fertilizing, spot weeding, mowing, trimming, applications of herbicides, fungicides, insecticides, and overseeding until a full, uniform, healthy, vigorous stand of vegetative ground cover free of weed, undesirable species, disease, and insects is achieved and accepted by the Architect. Specifically:

1. Watering Vegetative Ground Cover:

a. First Week: Provide water, backflow preventors, meters, labor, hoses, sprinklers and watering equipment needed to promptly germinate the vegetative ground cover seed, preventing it from drying out, and keeping it in a healthy, growing condition until final acceptance. The Owner will pay for water usage including trucking if required. Vegetative ground cover areas shall receive a minimum of one (1") of water per week, by natural rainfall, irrigation or a combination of both. Water lightly, daily until 2nd mowing (just enough water to keep the top ½" of soil moist, 1 time daily).

2. Second and Subsequent Weeks: Provide water, back flow preventors, meters, labor, hoses, sprinklers and watering equipment as required to maintain adequate moisture, in the upper four (4") inches of soil, necessary for the promotion of deep root growth until final acceptance. The Owner will pay for water usage including trucking if necessary. Vegetative ground cover areas shall receive a minimum of one (1") of water per week, by natural rainfall, irrigation or a combination of both. After 2nd mowing, water two (2) times weekly until thoroughly established.

3. Protect: Protect vegetative ground cover areas against trespass, vandalism and routine pedestrian traffic and Owner maintenance traffic by temporary fencing or other means.

4. Repair: Repair, rework, and overseed (as originally specified for that area) areas that have washed out, eroded, do not germinate and are vandalized or otherwise damaged. Overseeding rates are to be adjusted to 1/3 lb. of seed per 1,000 s.f.

5. Trimming: When feasible, post planting trimming is required. When overall vegetation canopy reaches a height of 18" - 24" use a string trimmer to trim the vegetation to a height of 8".

6. Fertilizer for Wildflower Seeded Areas Only: Apply subsequent fertilizer at the rate of 1.5-2 lbs./1,000 s.f. Apply a final fertilizer just prior to final acceptance at the same application rate.

7. Weed Control: Provide hand removal of tall weeds and volunteer growth a minimum of two (2) times per growing season (a growing season means Spring or Fall) and one (1) time before final acceptance. When infestation of weeds or crabgrass develops, treat infestation by hand weeding or herbicides control appropriate to the area. Furnish and install weed chemical control as recommended by manufacturer. Herbicides controls must be acceptable to the Owner. Obtain and pay for permits. Use as directed by the manufacturer and applicable laws, codes, ordinances and regulatory requirements. Under NO circumstances is it acceptable to seed or overseed over Nutsedge, Crabgrass or other grassy/broadleaf weeds.

8. Should the Contractor fail to protect and maintain the vegetative ground cover areas, the Owner may issue a five (5) day notification to the Contractor, hire his work done, and back charge this Contractor.

B. Maintenance by the Contractor continues through the certificate of substantial completion to final acceptance by the Architect as described below. Maintenance by Owner begins after final acceptance of the vegetative ground cover.

3.8 STANDARDS FOR FINAL ACCEPTANCE OF VEGETATIVE GROUND COVER: Review to determine final acceptance of vegetative ground cover will be made by the Architect, upon request. Provide notification at least five (5) working days before requested review date.

A. Vegetative ground cover areas will be acceptable provided requirements, including maintenance, have been complied with. A healthy, vigorous, uniform, full stand of

vegetative ground cover is established free of weeds, undesirable grass species, disease, and insects. Grass roots shall have matured to a minimum of 2" depth as determined by the Architect when core samples are taken.

B. Any vegetative ground cover which contains disease, more than 1% dead/bare spots, or any dead/bare area greater than one (1) square foot shall be rejected and the unacceptable area(s) repaired as originally specified at no additional cost to the Owner.

C. In the event the Contractor fails to complete the punch list items within a 30 day period with average temperatures of 40°F after the time of project Substantial Completion, the Contractor shall be liable to the Owner for any additional costs including those charged by the Architect.

3.9 CLEAN UP

During the contract and at intervals as directed by the Architect and as vegetative ground cover work is completed, clear the site of extraneous materials, rubbish, and debris. Leave the site in a clean, safe, neat, well-draining condition.

END OF SECTION 329201

SECTION 331101 - WATER DISTRIBUTION

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the water distribution system is shown on the drawings.

B. The water distribution work includes, but is not limited to, the following:

1. Trenching and Backfilling
2. Piping and jointing (to five feet from exterior building face)
3. Connections to existing water system
4. Valves & Valve Box(s)
5. Concrete Thrust Blocks
6. Clean Up

C. Provide materials, labor, equipment, and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312201 - Site Earthwork

B. Section 321201 - Site Concrete Work

C. Section 331102 - Disinfection of Water System

D. Section 334001 – Storm Drainage

1.3 REFERENCES (AWWA, latest edition)

A. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; American Water Works Association (ANSI/AWWA C104/A21.4).

B. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association (ANSI/AWWA C111/A21.11).

C. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association (ANSI/AWWA C151/A21.51).

D. AWWA C502 - Dry Barrel Fire Hydrants; American Water Works Association (ANSI/AWWA C502/C502a).

E. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association (ANSI/AWWA C509/C509a).

F. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association (ANSI/AWWA C600).

F. ASTM D3350 - Polyethylene Plastics Pipe & Fittings Materials.

G. ASTM F714 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.

H. NSF/ANSI 61 – Drinking Water System Components.

I. ASTM F1055 –Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.

J. ASTM D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

K. ASTM F2164 – Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure.

L. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc..

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Provide Manufacturer's Product Data (MPD) for:

1. Water pipe and joints
2. Valves and Valve Boxes

B. Provide Material Certificates and samples as noted:

1. Granular Backfill: Material Certificates and sample.
2. 4,000 psi concrete: Material Certificate showing design mixes.

C. Permits, Notification, Certification, and Test Reports: Provide per 1.5, C, D and 3.3, F & G below.

1.5 JOB CONDITIONS

A. Job conditions in Section 334001 apply.

B. Water distribution work shall conform to standards of applicable government authorities having jurisdiction.

C. Obtain and pay for permits and approvals required by local authorities. Copy permit to Architect.

D. Notify Municipal Engineer and Fire Marshall/Chief in writing two (2 wks.) weeks prior to start of work. Copy letter to Architect.

E. Construction Review: Notify the Architect when the work is approximately 25%, 75% and 95% complete.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NYS Health Department Standards.

B. Codes and Standards: ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", comply with applicable provisions except as otherwise indicated.

1.7 TESTING

A. Notify Architect and Municipal Engineer a minimum of forty-eight (48 hrs.) hours in advance.

B. Provide materials and labor to carry out testing in the presence of the Architect and/or Municipal Engineer. Test water system with an hydrostatic pressure test for two hours in conformance with AWWA Standard C600 or ASTM F2164.

1. Do not exceed the following leakage rates per 1,000 feet of pipe, respectively, for the two hour test period at 150 psi:

Pipe Diameter	Allowable Leakage
¾"	0.124 gal.
1"	0.165 gal.
1 ½"	0.248 gal.
2"	0.331 gal.
2 ½"	0.414 gal.
3"	0.550 gal.
4"	0.662 gal.
6"	0.993 gal.
8"	1.324 gal.
10"	1.655 gal.
12"	1.986 gal.

2. Valid test pressure shall not vary more than (+/-) 5 psi.

3. Any leakage beyond limits described shall be located and repaired. Retest system to insure adequate performance of pipe.

2.0 PART 2 - PRODUCTS

2.1 PIPING, FITTINGS, AND BACKFILL

A. PVC pipe, pressure class 200 conforming to AWWA C900. Joints shall be twin gasketed, flexible rubber, rated for maximum working pressure of 200 psi, conforming to ASTM F477.

B. Backfill shall be as specified in Section 312201, 2.1, B.

C. Concrete for thrust blocks shall be 4,000 psi as specified in Section 321301, 2.1.

2.2 GATE VALVE AND VALVE BOX

A. Gate Valves - Open Counter-clockwise (left)

1. Valves shall be 125-pound flanged gate valves meeting American Water Works Association (AWWA) Standards, iron body, bronze mounted, double disc type with removable brass seats, non-rising manganese bronze stems, and open counter clockwise.

2. Valves shall be successfully subjected to a hydrostatic pressure test of not less than four (4) times the maximum working pressure.

3. Standard of quality shall be AWWA gate valves as manufactured by Kennedy or equal approved by the local Water Authority.

4. Valves shall be compatible with the type of pipe and joint being used without the use of an adaptor.

5. Direction of Opening: Right to open or as directed by the Municipality.

B. Valve Box shall be cast iron, yoke type, adjustable for height with cast iron cover marked "Water". Boxes shall be designed for pipe in trench having a 5'-6" cover over pipe.

2.3 ACCESSORIES

A. Concrete for Thrust Restraints:

1. Portland Cement: ASTM C150, Type 1A.
2. Aggregates: ASTM C33; coarse aggregate - crushed limestone, maximum one inch (1") size; fine aggregate - clean, sharp, natural sand.
3. Water: Clean, potable.
4. Air-Entraining Admixture: ASTM C260, Darex or Architect approved equal.
5. Ready Mix Concrete: ASTM C94.
6. Minimum Concrete Strength: Compressive strength shall be greater than 4,000 psi at 28 days; minimum cement content – 6.5 bags/c.y.; 4.0 gals./bag of cement; slump from 1-1/2" to 3"; air entrainment from 5% to 8-1/2%; and flexural strength (ASTM C78) shall be greater than 650 psi at 28 days.

B. Flexible Couplings: Smith-Blair Couplings. Approved product numbers:

1. 441 Cast straight & transition coupling
2. 482 Cast end cap coupling
3. 261 All stainless steel full circle clamp coupling
4. 264 All stainless steel tapped full circle clamp coupling
5. 912 Cast iron flanged coupling adapter

C. Mechanical Joint Retainer Glands: Ductile iron, AWWA/ANSI C110/A21.10 and C111/A21.11. Set screws shall be 5/8" NC thread with torque-set head, or 5/8" square head bolts, with knurled cup-point, made of 4140 steel and hardened to Rockwell "C" scale 4547.

3..0 PART 3 - EXECUTION

3.1 CONNECTIONS TO OTHER WATER SYSTEMS

A. Connections to the existing water supply system:

1. Provide the Municipality with at least two (2) weeks notice prior to conducting work so that field procedures and installations can be reviewed by a representative of the Municipality. Copy letter to Architect.

2. Locate accurately per site drawings. Verify inverts, locations, and sizes. Notify Architect of any discrepancies prior to installation.

3. Connect new water service main to the existing main using a Tapping Sleeve and Valve as specified hereafter:

   a. Pipe to be tapped shall be excavated and thoroughly cleaned at the location to be tapped. Cleaning shall extend a minimum of 12 inches on each side of the sleeve.
   b. Pipe, sleeve, and valve shall be disinfected in accordance with AWWA C651.
   c. Tapping sleeve and valve shall be installed in accordance with manufacturer's instructions, and bolts tightened to the proper torque.
   d. Tap shall be made in the presence of Municipal Public Works Plumbing Inspector after sleeve and valve have been pressure tested to ensure proper installation. If sleeve or valve fails pressure test, the defective installation shall be disassembled and reinstalled.

4. Make connections securely, watertight, and as detailed.

3.2 TRENCHING AND BACKFILL

A. See Section 312201 for additional requirements.

B. Hand trim excavation for accurate placement of pipe. Remove all stones greater than 4" diameter to a depth of at least 6" below the bottom of the pipe.

C. Form and place concrete for pipe thrust restraints at each change of pipe direction and dead ends as shown on the Contract Drawings. Place concrete to permit full access to pipe and pipe accessories. Care shall be exercised in the placement of concrete to allow disassembly of mechanical joints.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.3 INSTALLATION - PIPE

A. Water pipe shall have a minimum of five and one half (5- 1/2') feet of cover as measured from the top of the pipe to finish grades. Bed pipe as detailed. Place backfill around pipes to equal depths on both sides as work progresses. When pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by

other means. When water is in the trench, plugs shall not be removed until danger of water entering the pipe has passed.

B. Install pipe to indicated elevation to within tolerance of 1 inches.

C. No pipe shall be laid upon a foundation in which frost exists, nor at any time when there is a danger of the formation of ice, or the penetration of frost at the bottom of the excavation.

D. Two brass wedges shall be inserted securely between bell and spigot ends of pipes, maintaining the full watertightness of the joint.

E. Otherwise install ductile iron piping and fittings to AWWA C600.

F. Route pipe in straight line.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install access fittings to permit disinfection of water system performed under Section 331102.

I. Compact trenches to at least ninety five (95%) percent maximum density as specified in Section 312201. Settlement shall be repaired by the Contractor at no additional cost to the Owner.

J. Install concrete cradles, saddles and thrust blocks where shown on drawings as detailed and specified in Section 321301, Part 3. Provide bracing and blocking at bends, 22-1/2 degrees or greater, tees, crosses and plugs. Block and anchor with concrete so that there will be no movement of the pipe in the joints due to internal or external pressures. The concrete shall be placed around the fittings and completely fill the space between the fittings and walls of the trench, from 6" below the fittings of pipe, to 12" above the fittings. The anchor concrete shall be so placed that the bell and spigot joints or other joints may be recaulked or tightened if necessary. Concrete thrust blocks shall conform dimensionally to details shown on drawings.

3.4 INSTALLATION - VALVES

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover approximately one inch below surrounding finished grade. Care shall be exercised in backfilling around valve boxes to prevent displacement of box.

3.5 FIELD QUALITY CONTROL

A. All new water piping and fittings shall be thoroughly flushed prior to pressure testing. The flushing rate shall be at least 2.5 ft./sec.

B. Pressure test all new water piping and fittings using a test pressure not less than 150 psi.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and

retest at no cost to the Owner.

D. After all work has been successfully inspected and tested, the new water piping, valves, and fittings shall be disinfected by the Contractor in accordance with AWWA C651, latest edition as specified in Section 331102 of these Specifications.

3.6 CLEAN UP

During the contract and at intervals as directed by the Architect and as the water distribution system is completed, clear the site of pipe, trench and backfill material, stone, concrete and debris. Leave the site in a clean, safe, well draining, and neat condition.

END OF SECTION 331101

SECTION 331102 - DISINFECTION OF WATER SYSTEM

1.0 PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Disinfection of site domestic and fire water lines and appurtenances specified in Section 331101.

B. Testing and reporting results.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 331101 - Water Distribution

1.3 REFERENCES

A. AWWA B300 - Hypochlorites; American Water Works Association; 1992 (ANSI/AWWA B300).

B. AWWA B301 - Liquid Chlorine; American Water Works Association; 1992 (ANSI/AWWA B301).

C. AWWA B302 - Ammonium Sulfate; American Water Works Association; 1995 (Revised) (ANSI/AWWA B302).

D. AWWA B303 - Sodium Chlorite; American Water Works Association; 1995 (Revised) (ANSI/AWWA B303).

E. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 1992 (ANSI/AWWA C651).

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Test Reports: Indicate results comparative to specified requirements.

B. Certificate: Certify that cleanliness of water distribution system meets or exceed specified requirements.

C. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

D. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.

2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of NYS Department of Health.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

1.6 REGULATORY CERTIFICATION REQUIREMENTS

A. Provide certificate of compliance from authority having jurisdiction indicating approval of water system. Provide written certification from Village Public Works Superintendent that water system has been tested for leakage and sterilized and disinfected in a manner satisfactory to the Health Department having jurisdiction, but in no event less stringent than that provided for in AWWA Standard for disinfecting water mains C601, latest issue. Hypochlorites and liquid chlorines used in disinfection shall conform to most recent AWWA Standards B300 and B301. Provide certification prior to Architect issuing final acceptance. No water main or pipes shall be placed into service until test results are provided documenting that the water system is bacteriologically safe.

2.0 PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

3.0 PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.2 EXECUTION

A. Provide specific water main taps located adjacent to ends of main and attach required equipment to perform the work of this Section.

B. Inject treatment disinfectant along with potable water into piping system. Chlorine shall be fed at a constant metered rate into the feed water so that the chlorine concentration will result in at least 50 milligrams per liter (parts per million) concentration. Chlorine required to produce .50 mg/l concentration per 100 feet of pipe shall be as follows: 4” - 0.33 Gal. of 1% chlorine solution, 6" - 0.73 Gal. of 1% Chlorine Solution; 8" - 1.30 Gal. After filling the main pipe with chlorine solution, open each service line and hydrant

branch to fill them with the same chlorine solution. Test the solution as it is withdrawn from each point until at least 50 mg/l concentration is obtained.

C. Maintain disinfectant in system for 24 hours. Read and record chlorine residual after the 24 hour contact time; Minimum allowable level shall be 20 ppm.

D. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water. After flushing, take 2 samples, one from the domestic service line at its connection to the building plumbing system and one from a hydrant remote from the domestic service connection. Submit these samples for bacteriological analysis. Submit test reports to the Architect. If the initial disinfection fails to produce acceptable results, the procedure shall be repeated until a satisfactory report is obtained.

E. Temporary taps shall be excavated, shut off and abandoned following satisfactory quality test results. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Test samples in accordance with AWWA C651.

3.4 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as the disinfection of water system is completed, clear the site extraneous materials and debris. Leave the site in a clean, safe, well draining, neat condition.

END OF SECTION 331102

SECTION 334001 - STORM DRAINAGE

1.0 PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The extent of the storm drainage is shown on the drawings.

B. Storm drainage work includes, but is not limited to:

1. Trenching, backfilling and compaction
2. Storm structures, castings, and appurtenances
3. Piping, jointing and fittings
4. Connection(s) to other storm system(s)
5. Adjusting existing storm structures and other utilities
6. Storm Water Management Trench (SMT)
7. Flat Drains
8. Storm Line Cleaning and Scoping
9. Quality Control Testing and Submittals
10. Clean Up

C. Provide materials, labor, equipment and services required to accomplish related work in accordance with the drawings and specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 311201 - Site Preparation

B. Section 312501 - Erosion, Sediment and Pollution Control

C. Section 312201 - Site Earthwork: For Elaboration of Shoring and Bracing, Dewatering, Backfilling, Compaction and Field Quality Control Testing.

D. Section 321201 - Asphalt Paving

E. Section 321301 - Site Concrete

F. Section 331101 - Water Distribution

1.3 REFERENCES

A. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Flow Applications.

1.4 SUBMITTALS: (See Section 311201, 1.5)

A. Shop Drawings (SD) required for:

1. Precast concrete drainage structures showing sizes, elevations for openings and, HS20 loading certification.
2. Trench Drain and Trench Drain Catch Basin Layout

B. Manufacturer's Product Data (MPD) required for:

1. Drainage structures and castings
2. Pipe, joints and fittings
3. Flat Drains
4. Stormwater Management Trench for Pipes and Geotextiles
5. Trench Drains, Trench Drain Catch Basins, and Grates
6. Stormwater Pollutant Separation Systems (SPS)

C. Quality Control Submittals:

1. Provide a list of completed projects including Owner's contact information for each project, demonstrating compliance with applicable "Experience Requirements" specified in "Quality Assurance" of this specification section.

1.5 QUALITY ASSURANCE

A. Drainage Contractor Experience Requirements:

1. Submit business name, business owner(s) name(s), business address, telephone number, website and/or email address signed by the Contractor/Subcontractor who meets the qualifications set forth in this specification and is proposed by the Contractor to perform the Drainage for this Project.

2. Provide a list of at least four (4) Drainage work projects of comparable size, scope and quality completed successfully by the proposed Contractor/Subcontractor within the past three (3) years that includes the date completed, project Owner's name and current contact information, including telephone numbers and email addresses.

1.6 JOB CONDITIONS

A. Job conditions in Section 312201 apply.

B. Plan and execute piping work so that trenches are not opened for more than two hundred (200') feet in advance or left unfilled more than one hundred (100') feet behind. No overnight open excavation is permitted.

C. CONSTRUCTION REVIEW: Notify the Architect when the storm system is approximately 25%, 50% and 95% complete.

1.7 SUBSTITUTIONS

A. Contractor is responsible for design of any substituted structures, systems or units in Section 334001 by a NYS licensed engineer. Submit to Architect for approval.

B. If a product is being submitted as a substitution to the specified product; the the Prime Contractor shall submit and request a product material substitution with his/her bid. The Prime Contractor shall at a minimum provide the following for review by the Architect and Owner:

1. All submittals as specified herein

2. Product comparison

3. Cost Information (including proposal of change in Contract Sum)

4. Contractor's certification that proposed substitution complies with requirements in the Contract Documents

5. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2.0 PART 2 - PRODUCTS

2.1 BACKFILL

A. Backfill for pipes, Stormwater Management Trenches (SMT), drainage structures, and drywells shall be as specified in Section 312201.

2.2 STORM STRUCTURES AND CASTINGS

A. Storm Inlets and Manholes:

1. Shall be precast reinforced portland cement concrete conforming to the size(s) and shape shown on drawings, designed for AASHTO HS-20 loading. The materials and structural design of the structures shall be per ASTM C478 and ASTM A497, Grade 60. The minimum compressive strength of the concrete in the structure base, riser, and top section shall be 5,000 psi. The minimum wall thickness shall be one twelfth of the internal diameter of the riser or largest cone diameter. All joints shall be waterproofed with O-ring rubber gaskets and sealed with a mastic treatment in accordance with ASTM C990. Any grout used within the system shall meet the ASTM C 1107. Manhole connector holes shall be equipped with a seal gasket that meets or exceeds material specification of ASTM C-923 or other locally approved methods. Base units shall be extended. Standard of quality shall be as manufactured by Zeiser Wilbert, Jefferson Concrete, Fort Miller or Architect approved equal.

2. Castings: Provide HS20 loading and bike safe grates, ductile iron meeting grade 65-45-12 as determined by ASTM A536-84, sizes as noted on the plans. Frames, covers and grates shall be machined to prohibit rocking. Standard of Quality shall be Neenah Foundry, East Jordan Iron Works, US Foundry, or Architect approved equal.

B. Trench Drain and Trench Drain Catch Basin (Standard Site Work):

1. Trench Drain shall be fabricated of polymer concrete, 150 mm (6 in) wide, 100 mm (4 in) ID and 166 mm (6.54 in) deep with radius non-sloping bottom having the following attributes:

a. Length: 1000 mm (39.37 in).

b. Anchoring ribs: full length.
c. Grate locking slots: blind, vibration dampening, thermoplastic.
d. Interlocking ends.
e. Provide end frames where needed.

2. Grate: Fabricated of black polypropylene.

a. Full width transverse drainage openings.

3. Accessories:

a. Locking devices
b. Catch basins - System 4000.
c. Trash buckets with removable galvanized steel trash baskets.
d. Grate removal tool (provide 2) Part # 13118

4. Standard of quality: shall be ACO SPORT SYSTEM 4000 with grate #97393 catch basin with galvanized trash baskets as manufactured by SportsField Specialties, Inc. 888-975-3343 or Architect approved equal.

C. Stormwater Pollutant Separation System (SPS):

1. Shall be precast concrete conforming to the size and shape shown on drawings, designed for HS-20 loading. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858. The minimum compressive strength of the concrete in the manhole base, riser, and top section shall be 5,000 psi. The minimum wall thickness shall be one twelfth of the internal diameter of the riser or largest cone diameter. All joints shall be waterproofed with wrapped gaskets or sealed with a mastic treatment. Any grout used within the system shall meet the ASTM C 1107. Manhole connector holes shall be equipped with a seal gasket that meets or exceeds material specification of ASTM C-923 or other locally approved methods. Constructed of reinforced Portland cement concrete as manufactured by Zeiser Wilbert, Jefferson Concrete, Fort Miller or Architect approved equal.

2. The access cover shall be designed for HS-20 loading and shall provide a minimum of 30 inch clear opening. Standard of quality: Frame Grate and Vented Cover Model #R-1733-1 with locking device as manufactured by Neenah Foundry Company or Architect approved equal.

3. The storage capacities for pollutants that settle (sediment) and float (oil) shall not be less than the volumes listed in Table 1. The treatment system shall operate as intended and perform as specified herein as pollutants accumulate. The accumulation of pollutants that settle shall not reduce the volume required in the treatment system for separation and for preventing re-suspension and washout, or reduce the floatables storage volume capacity.
4. Stormwater Pollutant Separator Unit (SPS):

a. Performance of the treatment system shall be based on independent full-scale laboratory testing and shall adhere to the Performance Specifications listed in Table 1. The laboratory testing used as the basis

of product performance shall be undertaken in accordance with testing protocols approved by New Jersey State Department of Environmental Protection (DEP) and recognized verification agency NJCAT.

b. Performance of the treatment system shall be based on treating the Water Quality Flow rate (WQF) without re-suspension and washout of captured pollutants (scour). The Treatment Flow Rate listed in Table 1 shall be greater than or equal to the WQF.

1) NJCAT-certified treatment flow rates shall be based on 50% removal of a particle size gradation with a mean particle size of 75 microns, and a minimum particle size of 2 microns.

c. The treatment system shall convey the Peak On-line Flow Rates listed in Table 1 without causing upstream surcharge conditions. Full-scale independent laboratory scour testing shall demonstrate effluent control of less than or equal to 5 mg/L for all flows up to 200% of the approved treatment flow rates.

d. The treatment system shall be capable of capturing and retaining fine silt and sand size particles. Analysis of captured sediment from full-scale field installations shall demonstrate particle sizes predominately in the 20-micron range.

Table 1

FDHC Model	FDHC Dia.	Treatment Flow Rates	Peak Online Flow Rate	Maximum Pipe Diameter	Oil Storage Capacity	Sediment Storage Capacity
	(ft)	(cfs)	(cfs)	(in)	(gal)	(yd^3)
FD-8HC	8	6.00	50	48	1,120	2.8
FD-3HC	3	0.84	15	18	125	0.4
FD-4HC	4	1.50	18	24	191	0.7

e. Standard of quality shall be First Defense manufactured by Hydro International, (207) 756-6200 or Architect approved equal.

D. Area Drain(s): Shall be a watertight PVC, HS-20 loaded drain basin with drop-in integral grates. Structures shall be able to accommodate all connecting pipes watertight. Refer to drawings for sizes and grate styles.

1. 10” Standard light-duty drop-in, domed grate.
2. 30" Integral frame and ductile iron cover to match basin O.D.
3. Standard of quality shall be Nyloplast as distributed by Advanced Drainage Systems, Inc., 800-821 6710, or Architect approved equal.

E. Dry Wells:

1. Shall be pre-cast reinforced portland cement concrete with reinforcement conforming to ASTM C478 and ASTM A615 with AASHTO HS20 Loading. Openings shall be precast in each unit at the factory. Size(s) as shown on

drawings and constructed of reinforced Portland Cement concrete; as manufactured by Zeiser Wilbert, Jefferson Concrete, Fort Miller or Architect approved equal.

2. When the size of a manufacturer's product differs from the item as detailed on the drawings, provide the manufacturer's next larger size than detailed unless approved by the Architect in writing.

3. Castings: Provide HS20 loading and bike safe grates, ductile iron meeting grade 65-45-12 as determined by ASTM A536-84, sizes as noted on the plans. Frames, covers and grates shall be machined to prohibit rocking. Standard of Quality shall be Neenah Foundry, East Jordan Iron Works, US Foundry, or Architect approved equal. Refer to drainage details on drawings for model numbers and other information on castings.

2.3 STORM STRUCTURE APPURTENANCES

A. Precast Concrete Adjustment Rings: Shall be square or round depending on structure. Built in accordance to ASTM C478, and made of 5,000 psi concrete and reinforced steel, meeting ASTM A615 Grade 60, as manufactured by Fort Miller, Zeiser Wilbert, Jefferson Concrete or Architect approved equal.

B. Steps: Shall be copolymer polypropylene plastic reinforced with 1/2" diameter grade 60 steel as manufactured by M.A. Industries or Architect approved equal.

C. Mortar: Shall be lime, cement, and clean sand, 1:1:3 measured by volume, meeting ASTM C1107.

D. Coal Tar Sealer: Shall be used to coat the inside and outside of installed precast risers. Standard of quality shall be Hydralastic 836 as manufactured by W. R. Meadows, (800) 342-5976 or Architect approved equal.

E. Locking Device: For structures shall be Type E counter sunk bolts (minimum of two per cover). Standard of quality shall be "McGard Intimidator" lock bolts as manufactured by Neenah Foundry Company or Architect approved equal.

2.4 PIPING

A. High Density Polyethylene Pipe (HDPE): Shall be heavy duty dual wall, high density polyethylene (HDPE) pipe conforming to ASTM F2648 for 4" to 60" pipe with a smooth inner wall, annular corrugations, "n" flow rating of 0.012, and HS-20 loading capability with minimum one (1') foot cover for 4" to 48" pipe and two (2') foot cover for 6-" pipe. Joint couplings for pipe shall be connected using a bell &spigot joint, meeting AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be soil tight and gaskets, when applicable, shall meet the requirements of ASTM F477. Standard of quality shall be N-12 Mega Green ST IB pipe as manufactured by Advanced Drainage Systems, Inc., 800-821 6710, or Architect approved equal.

2.5 STORM WATER MANAGEMENT TRENCH

A. 4" to 10" Pipe: Shall be flexible, heavy duty, corrugated interior and exterior, perforated (or slotted) polyethylene pipe meeting requirements ASTM F-667 for 4" to 10" diameters. Standard of quality shall be ADS with prefabricated snap fittings as manufactured by Advanced Drainage Systems, Inc., (614) 457-3051 or Architect approved equal. Size pipe(s) as noted on drawings.

B. 12" to 24" Pipe and Fittings: Shall be heavy duty polyethylene (HDPE), corrugated interior and exterior, perforated pipe meeting requirements AASHTO M252, AASHTO M294, Type C. Standard of quality shall be ADS with prefabricated fittings as manufactured by Advanced Drainage Systems, Inc., (614) 457-3051 or Architect approved equal. Size pipe(s) as noted on drawings.

C. 4" to 12" Fittings: Shall be injection molded fittings with a smooth interior and exterior meeting requirements AASHTO M252 for 4" to 10" diameters, and ASTM M294 or ASTM F2306 for 12" diameter. Standard of quality as manufactured by Advanced Drainage Systems, Inc., (614) 457-3051 or Architect approved equal. Size pipe(s) as noted on drawings.

D. Backfill: Shall be clean, washed No. 1 stone as indicated in Section 312201.

E. Soil Separation Fabric: Shall be a commercially manufactured non- woven polypropylene filter fabric. Standard of quality shall be Mirafi 140N as manufactured by TenCate or Architect approved equal.

2.6 FLAT DRAINS

A. Shall be perforated filter-wrapped, oblong, 13" wide x 1.5" thick with internal bracing meeting ASTM D7001. All fittings shall be made of polyethylene with a min. cell classification of 424420C as defined and described in ASTM D 3350.

B. Standard of quality shall be ADS Advanedge as manufactured by Advanced Drainage Systems, Inc., (Tel. 800-821-6710) or Architect approved equal.

C. Provide the 12-4 Endout to connect the Flat Drain to a 4" perforated pipe that wye couples to the storm water management trench piping.

D. Secure all connections using manufacturer recommended PVC tape at all joints.

2.7 STORM LINE CLEANING & SCOPING

A. Contractor shall provide storm line cleaning and scoping in areas directed by the Architect and as shown on the plans.

B. Cleaning Equipment: Acceptable cleaning equipment includes, but is not limited to, rodding machines, bucket machines, hydraulic flushers, movable dams with flexible scrapers.

C. Scoping Equipment: Acceptable scoping equipment includes, but is not limited to, pipe inspection camera with pan-and-tilt, radial viewing that pans 275 degrees and rotates to 360 degrees. The camera shall have the following attributes:

1. Be operative in 100 percent humidity conditions.

2. Measure with an accurate footage counter that displays on the monitor the exact distance of the camera, to the nearest tenth of a foot, from the centerline of the starting manhole.

3. Camera with height adjustment so that the camera lens is always centered at half the inside diameter, or higher, in the pipe being televised.

4. Lighting for the camera shall be suitable to allow a clear picture of the entire pipe periphery.

5. The video camera shall be capable of showing on the digital inspection the Owner's name, project name, contractor name, date, line size and material, line identification (Owner's manhole numbers at both ends), ongoing footage counter, and slope and angle of pipe.

D. For four- and six-inch lateral internal television inspections a "push camera" shall be used to produce color DVD. Camera reel shall be equipped with a footage counter to identify approximate distances from the start of the inspection.

3.0 PART 3 - EXECUTION

3.1 CONNECTIONS TO OTHER STORM SYSTEM

A. Connections at Building(s):

1. Locate accurately per site and plumbing drawings. Verify invert and sizes. Notify Architect of any discrepancies immediately, prior to installation.

2. Install pipe and jointing to within five (5') feet of each building exterior. Install temporary plugs, cap end, mark above grade, and protect. Coordinate with Plumbing Contractor. Connection will be made by Plumbing Contractor.

3. The Plumbing Contractor shall be responsible for connecting the building drains and leaders to the site storm system.

4. Make connections securely, watertight and as detailed. Provide all necessary couplers and fittings to make connections.

B. Connections to existing Storm Systems:

1. Coordinate with the Municipality and other agencies having jurisdiction. Notify governing agency in writing a minimum of two (2) weeks prior to anticipated date of connection so that field procedures and installation can be reviewed by a representative of the Municipality. Copy letter to Architect.

2. Locate accurately per drawings. Verify inverts and sizes. Notify Architect of any discrepancies immediately, prior to installation.

3. Make connections securely, watertight and as detailed. Provide all necessary couplers and fittings to make connections.

3.2 TRENCHING AND BACKFILL

A. Reference: Refer to Section 312201 for elaboration of shoring and bracing, supporting, rock, dewatering, and backfilling.

B. Trenching:

1. Remove material encountered to the depth shown on drawings and with a maximum width of fourteen (14") inches and a minimum of nine (9") inches each side of conduit springline as detailed. Provide safe shoring, sheeting, and bracing. Remove before backfilling. Backfill excess or over excavation as described in Section 312201 to proper line and grade. Compact to 95% density.

2. When unsatisfactory soil materials are encountered at design elevations, immediately notify the Architect in writing via email. Continue as directed by the Architect. When conditions are not a result of Contractor's negligence, additional excavation may be directed by the Architect and paid for as a Change Order on a unit price basis in accordance with specification Section 312201.

C. Water: Remove from trenches; drain trenches and/or provide sump pits and pumping equipment as necessary to keep trenches stabile and dry at no additional cost to the Owner.

D. Soft Material in Trench Bottom: Dry out and stabilize or remove and replace with imported granular backfill material to achieve firm, stable foundation at no additional cost to the Owner.

E. Rock: Remove boulders and rock within one (1'-0") foot of pipe. Provide one (1'-0") foot of granular backfill between rock and conduits at no additional cost to the Owner.

F. Backfill: Conform to details on drawings and as specified. Compact backfill to a minimum 95% of optimum density.

3.3 STORM STRUCTURES INSTALLATION

A. Pre-Cast Structures:

1. Install with corresponding extended precast base section. Precast base units shall be modified in the factory to have the correct size openings for piping.

2. Provide drainage structures as detailed, built to finished grades given. Backfill with imported granular backfill material around drainage structure and compact to 95% density to avoid settlement.

3. Mortaring: Thoroughly wet concrete risers before laying. Mortar joints. Joints shall be completely full and struck flush.

4. Install any required steps in a continuous flight, avoiding any conflict with piping.

5. Construct channels in base of storm structures for positive flow from inlet to outlet piping where detailed.

6. Build completed structure to avoid any infiltration or exfiltration of water except at underdrains or storm water management trenches.

B. Dry Well Units: Install as detailed, built to finished grades given. See masonry details for installation of casting. Build drywells to facilitate exfiltration of water. Line drywells with soil separation fabric and backfill with No. 1 stone as specified.

C. Trench Drains and Trench Drain Catch Basins: Install as detailed, built to finish grades given. Securely anchor trench drain with reinforcing bars or other method while concrete is being poured. Provide manufacturer's representative on site to advise installation crew during initial stages of the process. Slope trench drain invert towards trench drain catch basin. Secure castings. Produce survey of trench drain as noted in "Quality Control Submittals" of this specification section.

3.4 CASTINGS

A. Provide the type specified and shown on drawings. Build to the finish grade as shown on drawings.

B. Set castings firmly. Loose or rocking castings shall be rejected by the Architect.

C. Paint all installed castings (inside and outside) with two (2) coats of black rust inhibitive paint as directed by the Architect.

3.5 ADJUSTING EXISTING UTILITIES

Adjust existing utilities as necessary to maintain utility service and meet finished grade conditions. Existing utilities include but are not limited to; hydrants, water valves, gas valves, electric pull boxes and manholes, storm drainage structures, cable and telephone markers, fiber optic cables, sanitary cleanouts and manholes, and guy wires.

3.6 PIPE LAYING

A. Shall be in accordance with ASTM D2321 and pipe manufacturer requirements.

B. Bed pipe in granular backfill or concrete as shown on drawings, compact under springline of pipe to assure firm support. Align pipe to line and grade given in plan and profile. Set batter boards or set by laser level.

C. Pipe joints shall be made using the flexible gaskets specified. Clean bell end of any debris and lubricate. Remove protective wrap from gasket. Do not allow lubricated section to touch dirt or backfill. Foreign matter could adhere to surface and compromise joint integrity. Push together pipes so that the gasket is firmly seated in the socket. Always push spigot end into bell, not bell end into spigot.

D. Place backfill around pipes to equal depths on both sides as work progresses.

E. "Lamp" pipes to check for misalignment and breakage after backfilling has been completed. Replace pipes deviating more than 1/2" from line or grade at no additional cost to the Owner.

3.7 CONCRETE CRADLES, SADDLES AND COLLARS

As specified in Section 321301.

3.8 STORM WATER MANAGEMENT TRENCH

A. Use only pipe which is undamaged and flexible (have not been exposed to direct sunlight for more than six (6) months causing brittleness, cracking or splitting prior to placement). Pipe shall be stored for at least twenty-four (24 hrs.) hours in an area having a minimum temperature of fifty (50) degrees F.

B. Trenching: Remove material encountered to the depth shown on the drawings. Provide shoring, sheeting, and bracing as necessary for safety; remove before backfilling.

C. Install continuous envelope of soil separation fabric around the backfill up to subgrade of finish material. Fill stone to proper elevation and wrap top. Overlap fabric minimum twenty-four (24") inches at top and joints. Secure fabric joints to prevent separation and infiltration of adjacent materials and separation of fabric.

D. Install pipe sloped as shown on drawings.

E. Compact backfill to maximum density of adjacent materials.

3.9 FLAT DRAINS

A. Install the Flat Drains at the intervals noted on the drawings. Securely attach ends of these composite drains into the perimeter collector header system with specified fittings.

B. Secure all connections with PVC tape.

3.10 STORMWATER POLLUTANT SEPARATION UNIT

A. Install as specified in Section 334001, Part 3 and Manufacturer's instructions.

B. Do not connect to facilities generating industrial grease, oil, waste, toxic chemicals or high flows of salt contaminated water such as car washes or bus maintenance facilities.

C. Inspect immediately upon delivery. Do not install a cracked, broken, damaged or defective unit.

D. Verify proper excavation depth, pipe inverts and subgrade compaction. Correct deficiencies prior to commencing installation.

3.11 STORM LINE CLEANING & SCOPING

A. Cleaning Operations:

1. Potable water withdrawal from hydrants will be allowed for utility cleaning purposes. A contractor provided hydrant meter with backflow prevention device shall be used when withdrawing water from a fire hydrant.

2. The pipe sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the utility lines and manholes.

3. Any roots which could prevent adequate internal television inspection shall be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupine, and equipment such as high-velocity jet cleaners.

4. Flows diverted during cleaning operations shall be returned to the utility system.

5. Debris accumulated during cleaning operations shall be removed from the utility and disposed offsite.

B. Inspection and Scoping:

1. If during inspection of the utility section, the wastewater flow depth exceeds 20% of the inside pipe diameter, reduce the flow depth to an acceptable level by performing the inspection during minimum flow hours, bypass pumping, plugging or by pulling the camera with swab, high velocity jet nozzle or other acceptable dewatering device.

2. Video inspections performed while floating the camera is not acceptable.

3. Documentation of Television Inspection

   a. All inspections shall be documented using a data logger and reporting system.
   b. Inspection Logs: Computer printed location records shall be kept by the Contractor and shall clearly show the location and orientation in relation to an adjacent manhole. Other points of significance such as locations and orientations or service connections, building sewers, unusual conditions, roots, cross connections, broken pipe, presence of scale and corrosion, and other discernible features shall be recorded, and a copy of such records shall be supplied to the Owner.
   c. Video Recordings: Video recordings shall include an audio track recorded by the inspection technician during the actual inspection work describing the parameters of the line being inspected (i.e. location, depth, diameter, pipe material, pipe slope, etc.), as well as describing connections, defects and unusual conditions observed during the inspection. Video recording playback shall be at the same speed that it was recorded. Once inspected, the DVDs shall be labeled and become the property of the Owner.

4. Perform inspection immediately after line cleaning.

5. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the utilities condition. In no case will the camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with the proper documentation of the utility conditions shall be used to move the camera through the utility line.

6. During the inspection, the camera shall be temporarily stopped at each defect along the line. The nature, location, and orientation of the defect shall be recorded by the contractor. Where defects are also active infiltration sources, the rate of infiltration in gallons per minute shall be estimated by the Contractor and recorded. The camera shall also be stopped at all service connections and identified by footage and clock orientation.

7. The camera operator shall slowly pan and tilt and beginning and ending manhole connections, each service connection, joints, visible defects and at pipe material transitions.

8. Inspections shall be continuous for pipe segments between manholes.

9. All videos, notes, file names, etc. shall be cross referenced to the project site plan.

10. Should at any interval during the inspection and scoping the camera becomes unmovable, non-functioning, or unresponsive it shall be the contractor's sole responsibility to retrieve the camera, at no additional cost to the Owner. Any damage done to the site or storm system retrieving the camera shall be corrected immediately by the Contractor to match existing conditions.

3.12 FIELD QUALITY CONTROL

A. Density Testing: Perform all density testing for piping trenches and structure backfill as indicated in Section 312201.

3.13 CLEAN UP

A. During the contract and at intervals as directed by the Architect and as storm drainage is completed, clear the site of pipe, trench and backfill material, stone, concrete and debris. Leave the site in a clean, safe, well draining, neat condition.

B. Clean drainage structures, storm water management trenches and pipes: Clean out sediment, rubbish, construction debris, and foreign objects thoroughly, immediately prior to final acceptance.

END OF SECTION 334001