

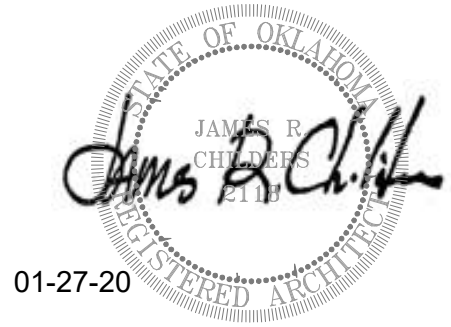


## BID PACKAGE 02 – ADDENDUM 02

**Date:** January 27, 2020

**Re:** Wilma P Mankiller Health Center Expansion

**From:** James R Childers Architect, Inc.  
45 South 4<sup>th</sup> Street  
Fort Smith, Arkansas 72901



This addendum forms part of the Contract Documents, and modifies the documents as noted below. Acknowledge receipt of this addendum in the space provided on the bid form. Failure to do so may subject the bidder to disqualification.

**Item 01** Updated table of contents and added sections listed below in volume 01  
07 21119 – Spray applied foam insulation  
07 7200 – Roof accessories  
07 8116 – sprayed fire-resistive materials

**Item 01** Updated table of contents and added sections listed below in volume 02  
25 5050.1 – controls analytics

# Project Manual

Bid Package 02  
Addendum No.02  
Volume I  
Divisions 07

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## Cherokee Nation WILMA P. MANKILLER HEALTH CENTER EXPANSION

Stilwell, Oklahoma

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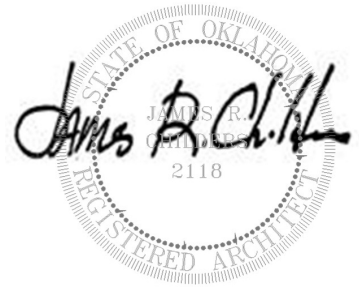
January 27, 2020



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## LEGEND

First Column: **Current Date for Section**  
 Second Column: Checked Indicates Section is Included in Current Issue  
 Third Column: Section Number  
 Fourth Column: Section Title



01.27.2020

## ISSUES

<b>Bid Package 01</b>	<b>Demolition/Foundation/Steel</b>	<b>Nov. 01, 2019</b>
<b>Bid Package 02</b>	<b>Construction Documents</b>	<b>Dec. 06, 2019</b>
<b>Bid Package 02</b>	<b>Addendum No. 01.</b>	<b>Jan. 10, 2020</b>
<b>Bid Package 02</b>	<b>Addendum No. 02</b>	<b>Jan. 27, 2020</b>

### NOTE FOR REVISED SPECIFICATION SECTIONS

1. DELETED INFORMATION IS INDICATED BY A STRIKETHROUGH (IE, ~~THIS IS DELETED~~).
2. NEW INFORMATION IS INDICATED BY A DOUBLE UNDERLINE (IE, THIS IS ADDED).
3. ALL REVISED INFORMATION IS FURTHER IDENTIFIED BY A HEAVY VERTICAL LINE TO THE RIGHT OF ALL REVISIONS IN EACH INDIVIDUAL SPECIFICATION SECTION (REFER TO HEAVY BOLD LINE TO THE RIGHT FOR AN EXAMPLE).

## VOLUME 1

### CIVIL, STRUCTURAL, ARCHITECTURAL

#### DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

	<input type="checkbox"/>	00 1115	Invitation to Bid
	<input type="checkbox"/>	00 2113	Instructions to Bidders
2019-11-01	<input type="checkbox"/>	00 3100	Available Project Information
	<input type="checkbox"/>	00 4100	Bid Form
	<input type="checkbox"/>	00 5200	Agreement Form
	<input type="checkbox"/>	00 6100	Bonds
2019-11-01	<input type="checkbox"/>	00 7200	General Conditions
	<input type="checkbox"/>	00 7300	Supplementary Conditions

#### DIVISION 01 - GENERAL REQUIREMENTS

<input type="checkbox"/>	01 0500	Design Selections
<input type="checkbox"/>	01 0510	Exterior Design Selections
<input type="checkbox"/>	01 0520	Interior Design Selections
<input type="checkbox"/>	01 1000	Summary
<input type="checkbox"/>	01 2100	Allowances
<input type="checkbox"/>	01 2200	Unit Prices

	<input type="checkbox"/>	01 2300	Alternates
2019-11-01	<input type="checkbox"/>	01 2500	Substitution Procedures
2019-11-01	<input type="checkbox"/>	01 2500a	Substitution Procedure Form
2019-11-01	<input type="checkbox"/>	01 2600	Contract Modification Procedures
2019-11-01	<input type="checkbox"/>	01 2900	Payment Procedures
2019-11-01	<input type="checkbox"/>	01 2900a	Project Cost Summary Form
2019-11-01	<input type="checkbox"/>	01 3100	Project Management and Coordination
2019-11-01	<input type="checkbox"/>	01 3200	Construction Progress Documentation
	<input type="checkbox"/>	01 3233	Photographic Documentation
2019-11-01	<input type="checkbox"/>	01 3300	Submittal Procedures
2019-11-01	<input type="checkbox"/>	01 4000	Quality Requirements
	<input type="checkbox"/>	01 4200	References
2019-11-01	<input type="checkbox"/>	01 4323	Special Inspection
2019-11-01	<input type="checkbox"/>	01 4339	Visual Mock-Up Requirements
2019-11-01	<input type="checkbox"/>	01 4516	Field Test for Water Leakage
2019-12-06	<input type="checkbox"/>	01 4529	Testing Laboratory Services
2019-12-06	<input type="checkbox"/>	01 4534	Testing of Piping Systems
2019-11-01	<input type="checkbox"/>	01 5000	Temporary Facilities and Controls
2019-11-01	<input type="checkbox"/>	01 6000	Product Requirements
2019-11-01	<input type="checkbox"/>	01 7300	Execution
2019-11-01	<input type="checkbox"/>	01 7416	Clean Up (Site Maintenance)
2019-11-01	<input type="checkbox"/>	01 7419	Construction Waste Management and Disposal
	<input type="checkbox"/>	01 7420	LEED Construction Waste Management and Disposal
2019-11-01	<input type="checkbox"/>	01 7700	Closeout Procedures
2019-11-01	<input type="checkbox"/>	01 7823	Operations and Maintenance Data
2019-11-01	<input type="checkbox"/>	01 7839	Project Record Documents
2019-11-01	<input type="checkbox"/>	01 7900	Demonstration and Training
	<input type="checkbox"/>	01 8111	Sustainable Construction Requirements
	<input type="checkbox"/>	01 8112	LEED Construction Requirements
	<input type="checkbox"/>	01 8113	LEED Construction Requirements for New Construction and Major Renovations
	<input type="checkbox"/>	01 8123	LEED Construction Requirements for Commercial Interiors
	<input type="checkbox"/>	01 8133	LEED Construction Requirements for Core and Shell Development
	<input type="checkbox"/>	01 8143	LEED Construction Requirements for Schools
2019-11-01	<input type="checkbox"/>	01 9113	General Commissioning Requirements

## **DIVISION 02 - EXISTING CONDITIONS**

2019-11-01	<input type="checkbox"/>	02 1113	Demolition
2019-11-01	<input type="checkbox"/>	02 4116	Building Demolition
2019-11-01	<input type="checkbox"/>	02 4119	Selective Demolition

## DIVISION 03 - CONCRETE

	<input type="checkbox"/>	03 0150	Concrete Patching
2019-11-01	<input type="checkbox"/>	03 1000	Concrete Forming and Accessories
	<input type="checkbox"/>	03 1500	Concrete Accessories
2019-11-01	<input type="checkbox"/>	03 2000	Concrete Reinforcing
2019-12-06	<input type="checkbox"/>	03 2100	Steel Reinforcement (Sidewalk)
2019-11-01	<input type="checkbox"/>	03 3000	Cast-In-Place Concrete
2019-12-06	<input type="checkbox"/>	03 3053	Cast-in Place Concrete (Site work)
	<input type="checkbox"/>	03 3500	Concrete Finishing
2019-12-06	<input type="checkbox"/>	03 3536	Concrete Finishing (Site work)
	<input type="checkbox"/>	03 3543	Polished Concrete
	<input type="checkbox"/>	03 3600	Special Concrete Finishes
	<input type="checkbox"/>	03 3800	Post-Tensioned Concrete
2019-11-01	<input type="checkbox"/>	03 4000	Precast Concrete
2019-12-06	<input type="checkbox"/>	03 4500	Architectural Precast Concrete
	<input type="checkbox"/>	03 4713	Tilt-Up Concrete
	<input type="checkbox"/>	03 4900	Glass-Fiber Reinforced Precast Concrete (GFRC)
	<input type="checkbox"/>	03 5216	Lightweight Insulating Concrete
	<input type="checkbox"/>	03 5300	Concrete Toppings
	<input type="checkbox"/>	03 5416	Hydraulic Cement Underlayment

## DIVISION 04 – MASONRY

2019-12-06	<input type="checkbox"/>	04 2100	Masonry Veneer
2019-11-01	<input type="checkbox"/>	04 2200	Reinforced Unit Masonry
	<input type="checkbox"/>	04 2300	Glass Unit Masonry
	<input type="checkbox"/>	04 4200	Exterior Stone Cladding
	<input type="checkbox"/>	04 4216	Steel Supported Stone Cladding
	<input type="checkbox"/>	04 7200	Cast Stone Masonry
	<input type="checkbox"/>	04 7500	Adhered Masonry Veneer

## DIVISION 05 – METALS

2019-11-01	<input type="checkbox"/>	05 1000	Structural Steel
2019-11-01	<input type="checkbox"/>	05 1213	Architecturally Exposed Structural Steel (AESS)
	<input type="checkbox"/>	05 1636	Barrier Cables
2019-11-01	<input type="checkbox"/>	05 2100	Steel Joists Framing
	<input type="checkbox"/>	05 5214	Ornamental & Misc. Metals
2019-11-01	<input type="checkbox"/>	05 3000	Steel Decking
	<input type="checkbox"/>	05 3123	Steel Roof Deck System
	<input type="checkbox"/>	05 3133	Permanent Metal Forming
2019-11-01	<input type="checkbox"/>	05 4000	Cold-Formed Steel Framing
	<input type="checkbox"/>	05 4300	Slotted Channel Framing
2019-12-06	<input type="checkbox"/>	05 5000	Metal Fabrications
2019-11-01	<input type="checkbox"/>	05 5100	Metal Stairs
	<input type="checkbox"/>	05 5213	Pipe and Tube Railings
2019-12-06	<input type="checkbox"/>	05 5214	Ornamental & Misc. Metals

<input type="checkbox"/>	05 5300	Metal Gratings
<input type="checkbox"/>	05 5813	Ornamental Metal Column Covers
<input type="checkbox"/>	05 7000	Ornamental Metal
<input type="checkbox"/>	05 7300	Ornamental Handrails and Railings

## DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

2019-12-06	<input type="checkbox"/>	06 1053	Miscellaneous Rough Carpentry
2019-12-06	<input type="checkbox"/>	06 1643	Exterior Gypsum Sheathing
2019-12-06	<input type="checkbox"/>	06 4023	Interior Architectural Woodwork
	<input type="checkbox"/>	06 4223	Slatwall Paneling
	<input type="checkbox"/>	06 6100	Simulated Stone Fabrications
2019-12-06	<input type="checkbox"/>	06 6400	Plastic (FRP) Paneling
	<input type="checkbox"/>	06 6413	Translucent Resin Panel Fabrications
	<input type="checkbox"/>	06 6419	Simulated Stone Paneling
	<input type="checkbox"/>	06 6713	Louvered Light Diffusers
	<input type="checkbox"/>	06 6813	Plastic Gratings

## DIVISION 07 - THERMAL AND MOISTURE PROTECTION

	<input type="checkbox"/>	07 0151	Preparation for Re-Roofing
	<input type="checkbox"/>	07 0152	Patching of Existing Roofing
	<input type="checkbox"/>	07 1114	Asphalt Mastic Dampproofing
	<input type="checkbox"/>	07 1328	Pre-Applied Sheet Waterproofing
	<input type="checkbox"/>	07 1352	Modified Bituminous Sheet Waterproofing
	<input type="checkbox"/>	07 1413	Hot Fluid-Applied Rubberized Asphalt Waterproofing
	<input type="checkbox"/>	07 1416	Cold Fluid Applied Waterproofing
	<input type="checkbox"/>	07 1616	Crystalline Waterproofing
	<input type="checkbox"/>	07 1700	Bentonite Waterproofing
	<input type="checkbox"/>	07 1800	Traffic Coatings
	<input type="checkbox"/>	07 1900	Water Repellents
2019-12-06	<input type="checkbox"/>	07 2100	Thermal Insulation
2020-01-27	<input checked="" type="checkbox"/>	07 2119	Spray-Applied Foam Insulation
2019-12-06	<input type="checkbox"/>	07 2400	EIFS
	<input type="checkbox"/>	07 2423	DEFS for Soffits
2019-12-06	<input type="checkbox"/>	07 2500	Mechanically Fastened Air and Water Barriers
2019-11-01	<input type="checkbox"/>	07 2600	Under-Slab Vapor Retarder
	<input type="checkbox"/>	07 2613	Rubberized Asphalt Vapor Retarders
	<input type="checkbox"/>	07 2713	Self-Adhering Air and Water Barriers
	<input type="checkbox"/>	07 3113	Asphalt Shingles
	<input type="checkbox"/>	07 3127	Simulated Slate Roofing
	<input type="checkbox"/>	07 3200	Roof Tiles
2019-12-06	<input type="checkbox"/>	07 4114	Metal Roof Panels
	<input type="checkbox"/>	07 4213	Formed Metal Wall Panels
	<input type="checkbox"/>	07 4229	Terra Cotta Wall Panels
	<input type="checkbox"/>	07 4243	Composite Metal Wall Panels
	<input type="checkbox"/>	07 4263	Insulated-Core Metal Wall Panels
2019-12-06	<input type="checkbox"/>	07 5013	Single-Ply Membrane Roofing
	<input type="checkbox"/>	07 5216	Modified Bituminous Membrane Roofing
	<input type="checkbox"/>	07 5556	Fluid-Applied Protected Membrane Roofing

	<input type="checkbox"/>	07 5563	Vegetated Protected Membrane Roofing
2019-12-06	<input type="checkbox"/>	07 6200	Flashing and Sheet Metal
2020-01-27	<input checked="" type="checkbox"/>	07 7200	Roof Accessories
	<input type="checkbox"/>	07 7600	Roof Pavers and Pedestal Assemblies
2020-01-27	<input checked="" type="checkbox"/>	07 8116	Cementitious Fireproofing
	<input type="checkbox"/>	07 8123	Intumescent Mastic Fireproofing
	<input type="checkbox"/>	07 8413	Penetration Firestopping
2019-12-06	<input type="checkbox"/>	07 8446	Fire-Resistive Joint Firestopping
	<input type="checkbox"/>	07 9100	Preformed Joint Seals
2019-12-06	<input type="checkbox"/>	07 9200	Joint Sealants
2019-12-06	<input type="checkbox"/>	07 9500	Expansion Control

**DIVISION 08 - OPENINGS**

	<input type="checkbox"/>	08 0610	Door Schedule
2019-12-06	<input type="checkbox"/>	08 1113	Hollow Metal Doors and Frames
	<input type="checkbox"/>	08 1114	Interior Hollow Metal Frames
	<input type="checkbox"/>	08 1170	Steel Fire Door and Frame Assembly
	<input type="checkbox"/>	08 1216	Interior Aluminum Frames
2019-12-06	<input type="checkbox"/>	08 1416	Prefinished Flush Wood Doors
	<input type="checkbox"/>	08 1433	Stile and Rail Wood Doors
2019-12-06	<input type="checkbox"/>	08 3113	Access Doors and Frames
	<input type="checkbox"/>	08 3213	Sliding Aluminum-Framed Glass Doors
2019-12-06	<input type="checkbox"/>	08 3313	Coiling Counter Doors
2019-12-06	<input type="checkbox"/>	08 3323	Overhead Coiling Doors
	<input type="checkbox"/>	08 3326	Overhead Coiling Grilles
	<input type="checkbox"/>	08 3338	Interior Side Coiling Grilles
2019-12-06	<input type="checkbox"/>	08 3400	Special Function Doors
	<input type="checkbox"/>	08 3513	Folding Doors
	<input type="checkbox"/>	08 3515	Accordion Folding Fire Doors
	<input type="checkbox"/>	08 3613	Sectional Overhead Doors
	<input type="checkbox"/>	08 4110	Interior Storefront
	<input type="checkbox"/>	08 4127	Exterior All-Glass Entrances and Storefronts
	<input type="checkbox"/>	08 4128	Interior All-Glass Entrances and Storefronts
	<input type="checkbox"/>	08 4213	Exterior Aluminum Entrance Doors
	<input type="checkbox"/>	08 4216	Interior Aluminum Entrance Doors
	<input type="checkbox"/>	08 4229	Automatic Entrances
	<input type="checkbox"/>	08 4233	Revolving Entrance Doors
	<input type="checkbox"/>	08 4243	Medical Specialty Sliding Entrances
	<input type="checkbox"/>	08 4400	Glazed Aluminum Framing Systems
	<input type="checkbox"/>	08 4426	Structural Glass Curtainwall
	<input type="checkbox"/>	08 4500	Translucent Insulating Panel Assemblies
	<input type="checkbox"/>	08 5113	Aluminum Windows
2019-12-06	<input type="checkbox"/>	08 5619	Sliding Pass Windows
	<input type="checkbox"/>	08 5656	Bullet-Resistive Windows
	<input type="checkbox"/>	08 6200	Unit Skylights
	<input type="checkbox"/>	08 6300	Metal-Framed Skylights
2019-12-06	<input type="checkbox"/>	08 7100	Door Hardware
	<input type="checkbox"/>	08 7121	Interior Automatic Door Operators for Staff Use
	<input type="checkbox"/>	08 7122	Automatic Door Operators for the Disabled
2019-12-06	<input type="checkbox"/>	08 8000	Glazing
2019-12-06	<input type="checkbox"/>	08 8300	Unframed Mirrored Glazing
	<input type="checkbox"/>	08 8816	Between Glass Blinds Units



- 08 8840 Switchable Privacy Glass Units
- 08 9100 Wall Louvers

**DIVISION 09 – FINISHES**

- 09 0565 Floor Preparation for Renovation Work
- 09 0600 Room Finish Schedule
- 09 2300 Gypsum Plastering
- 09 2400 Portland Cement Plastering
- 09 2600 Veneer Plastering
- 09 2613 Gypsum Veneer Plastering
- 09 2713 GFRG Fabrications
- 2019-12-06  09 2900 Gypsum Board Assemblies
- 2019-12-06  09 3000 Tiling
- 2019-12-06  09 5113 Acoustical Panel Ceilings
- 09 5133 Acoustical Metal Pan Ceilings
- 09 5135 Snap-in Metal Pan Ceilings
- 09 5423 Linear Metal Ceilings
- 09 5436 Suspended Decorative Grids
- 2019-12-06  09 5451 Linear Wood Wall and Ceiling Systems
- 09 6115 Concrete Floor Sealer
- 2019-12-06  09 6116 Liquid Floor Hardener
- 09 6119 Moisture Floor Treatment
- 09 6340 Stone Flooring
- 09 6400 Wood Flooring
- 2019-12-06  09 6500 Resilient Flooring
- 2019-12-06  09 6513 Resilient Base and Accessories
- 09 6520 Interlocking Rubber Tile Flooring
- 2019-12-06  09 6566 Resilient Athletic Flooring
  
- 09 6603 Precast Terrazzo Flooring for Stairs
- 09 6613 Thick-Set Terrazzo Flooring
- 09 6623 Thin-Set Terrazzo Flooring
- 2019-12-06  09 6723 Resinous Flooring
- 09 6800 Carpeting
- 09 6900 Access Flooring
- 09 7200 Wall Covering
- 09 7213 Tackboard Wall Coverings
- 09 7500 Interior Stone Facing
- 09 7723 Fabric Wrapped Panels
- 2019-12-06  09 8433 Acoustical Wall Panels
- 09 9100 Painting
- 09 9413 Textured Interior Coatings
- 09 9600 High-Performance Coatings
- 09 9613 Multicolored Interior Coatings
- 09 9653 Elastomeric Coatings
- 09 9663 Textured Acrylic Coating

## DIVISION 10 - SPECIALTIES

	<input type="checkbox"/>	10 1100	Visual Display Boards
	<input type="checkbox"/>	10 1146	Visual Display Fabrics
2019-12-06	<input type="checkbox"/>	10 1400	Interior Signage
	<input type="checkbox"/>	10 1443	Photoluminescent Exit Path Marking System
	<input type="checkbox"/>	10 1700	Telephone Specialties
2019-12-06	<input type="checkbox"/>	10 2113	Toilet Compartments
2019-12-06	<input type="checkbox"/>	10 2115	Cubicle Specialties
	<input type="checkbox"/>	10 2213	Wire Mesh Partitions
	<input type="checkbox"/>	10 2223	Accordion Folding Partitions
2019-12-06	<input type="checkbox"/>	10 2238	Operable Panel Partition
	<input type="checkbox"/>	10 2239	Vertically Folding Panel Partitions
2019-12-06	<input type="checkbox"/>	10 2613	Wall and Corner Guards
2019-12-06	<input type="checkbox"/>	10 2813	Toilet Accessories
	<input type="checkbox"/>	10 2819	Shower Doors and Enclosures
	<input type="checkbox"/>	10 4116	Emergency Key Cabinets
2019-12-06	<input type="checkbox"/>	10 4400	Fire Protection Specialties
	<input type="checkbox"/>	10 4450	Automated External Defibrillators (AED)
2019-12-06	<input type="checkbox"/>	10 5113	Metal Lockers
	<input type="checkbox"/>	10 5116	Wood Lockers
	<input type="checkbox"/>	10 5503	USPS-Delivery Postal Specialties
	<input type="checkbox"/>	10 5506	Private-Delivery Postal Specialties
	<input type="checkbox"/>	10 5713	Wall Mounted Coat Rack and Shelf
	<input type="checkbox"/>	10 7113	Exterior Sun Control Devices
2019-12-06	<input type="checkbox"/>	10 7310	Aluminum Walkways and Canopies
	<input type="checkbox"/>	10 7500	Flagpoles

## DIVISION 11 - EQUIPMENT

2019-12-06	<input type="checkbox"/>	11 1300	Loading Dock Equipment
	<input type="checkbox"/>	11 2400	Building Maintenance Equipment
	<input type="checkbox"/>	11 5213	Projection Screens
2019-12-06	<input type="checkbox"/>	11 7000	Medical Equipment
	<input type="checkbox"/>	11 7313	Wall-Mounted Fold-Up Writing Surface
	<input type="checkbox"/>	11 7316	Wall-Mounted Chart Rack

## DIVISION 12 - FURNISHINGS

	<input type="checkbox"/>	12 2113	Horizontal Louver Blinds
	<input type="checkbox"/>	12 2116	Vertical Louver Blinds
2019-12-06	<input type="checkbox"/>	12 2413	Roller Window Shades
	<input type="checkbox"/>	12 2500	Between Glass Blinds
	<input type="checkbox"/>	12 3553	Laboratory Casework
	<input type="checkbox"/>	12 3571	Stainless Steel Casework
	<input type="checkbox"/>	12 3640	Stone Countertops
2019-12-06	<input type="checkbox"/>	12 3661	Simulated Stone Countertops
	<input type="checkbox"/>	12 4816	Entrance Floor Grilles
	<input type="checkbox"/>	12 4843	Entrance Floor Mats
	<input type="checkbox"/>	12 6300	Stadium Seating
	<input type="checkbox"/>	12 9313	Bicycle Racks

## DIVISION 13 - SPECIAL CONSTRUCTION

<input type="checkbox"/>	13 2817	Ballpark Netting and Supports
<input type="checkbox"/>	13 3448	Pre-Fabricated Rooftop Helipad
<input type="checkbox"/>	13 4900	Radiation Protection
<input type="checkbox"/>	13 4923	RF/MRI Modular Shielding Enclosure

## DIVISION 14 - CONVEYING EQUIPMENT

2019-12-06	<input type="checkbox"/>	14 1000	Dumbwaiters
	<input type="checkbox"/>	14 2100	Electric Traction Elevators
	<input type="checkbox"/>	14 2400	Hydraulic Elevators
	<input type="checkbox"/>	14 3100	Escalators
	<input type="checkbox"/>	14 9100	Chutes
	<input type="checkbox"/>	14 9200	Pneumatic Tube Systems

## DIVISION 31 - EARTHWORK

2019-11-01	<input type="checkbox"/>	31 1100	Cleaning and Grubbing
	<input type="checkbox"/>	31 2119	Site Grading
2019-11-01	<input type="checkbox"/>	31 2300	Excavation & Fill
2019-11-01	<input type="checkbox"/>	31 2311	Earthwork for Building Construction
2019-12-06	<input type="checkbox"/>	31 2333	Trenching
2019-11-01	<input type="checkbox"/>	31 2500	Erosion Control
2019-11-01	<input type="checkbox"/>	31 2573	Temporary Silt Fence
2019-12-06	<input type="checkbox"/>	31 3116	Termite Control
2019-12-06	<input type="checkbox"/>	31 4134	Excavation/Trench & Shore
	<input type="checkbox"/>	31 6218	Mini-Piles
2019-11-01	<input type="checkbox"/>	31 6613	Aggregate Piers

## DIVISION 32 - EXTERIOR IMPROVEMENTS

2019-12-06	<input type="checkbox"/>	32 1123	Aggregate Base Course
2019-12-06	<input type="checkbox"/>	32 1313	Concrete Paving
	<input type="checkbox"/>	32 1413	Interlocking Precast Concrete Paving
	<input type="checkbox"/>	32 1416	Brick unit Paving
	<input type="checkbox"/>	32 1440	Stone Paving
2019-12-06	<input type="checkbox"/>	32 1613	Concrete Curb & gutters
2019-12-06	<input type="checkbox"/>	32 1614	Concrete Side Walk
	<input type="checkbox"/>	32 1715	Parking Accessories
	<input type="checkbox"/>	32 3113	Chain Link Fencing
	<input type="checkbox"/>	32 3115	Tubular Steel Fencing
	<input type="checkbox"/>	32 3117	Gate Operators
	<input type="checkbox"/>	32 3121	Cable Guardrail System
2019-12-06	<input type="checkbox"/>	32 3223	Segmental Retaining Walls

**DIVISION 33 - UTILITIES**

2019-12-06	<input type="checkbox"/>	33 0516	Manholes Vaults
2019-12-06	<input type="checkbox"/>	33 0526	Utility Line Marking
2019-12-06	<input type="checkbox"/>	33 0527	Connection to Existing Utilities
2019-12-06	<input type="checkbox"/>	33 0533	Plastic Pipe (water & San. Swr.)
2019-12-06	<input type="checkbox"/>	33 1113	HDPE Potable Water Pipe
2019-12-06	<input type="checkbox"/>	33 1216	Valves
2019-12-06	<input type="checkbox"/>	33 1219	Hydrants
2019-12-06	<input type="checkbox"/>	33 1300	Disinfection of Waterlines
2019-12-06	<input type="checkbox"/>	33 4100	Storm Drainage

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## SECTION 07 2119

### SPRAY-APPLIED FOAM INSULATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Spray-applied foam installation and supplementary items necessary for a complete installation.
  - 1. Foam Insulation: Closed-cell spray-applied polyurethane foam insulation for the following locations:
    - a. Interior side of exterior wall assemblies.
    - b. Underside of elevated slab.
  - 2. Thermal Barrier: Thermal barrier applied to foam insulation for a thermal barrier rating of 15 minutes.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: Manufacturer technical literature and tested physical and performance properties for each product and system indicated.
  - 1. Include manufacturer specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.
  - 2. Include manufacturer printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions.
- B. Samples: Submit clearly labeled samples, 12 in (300 mm) square of spray-applied thermal insulation on rigid backing and 3 by 4 in (75 by 100 mm) minimum size of each additional material specified or required.
- C. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, and details of all typical conditions and components and attachments to other work.
  - 1. Show locations and extent of installations.
  - 2. Indicate intersections with other envelope assemblies and materials, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover or intersect the insulation are secured, and how miscellaneous penetrations such as conduits, pipes electric boxes and similar items are sealed.
  - 3. Indicate types of substrate preparations required before applying insulation.
    - a. Include recommended values for field adhesion test on each substrate.
  - 4. Show minimum thicknesses needed to achieve required thermal rating specified.

5. Thermal Barrier: Include graphic/visual definition of required 15 minute thermal barrier, completely protecting foam insulation, indicating all materials/assemblies used for this purpose. Include definition of thermal barriers and any other fire-protective assemblies/components provided in lieu of thermal barrier. At locations where metal fabrications penetrate foam insulation, or act as a thermal bridge from interior space to spray foam, clearly define method for fire protecting these metal fabrications and preventing unacceptable heat transfer to foam insulation.
6. Details shall include, but not be limited to, installations at the following conditions:
  - a. Firestopping sealant at slab edge.
  - b. Head, sill, and jamb of punched openings.
  - c. Expansion joints, penetrations, roof, and all terminations.
  - d. Connections to building structural frame.

### **1.3 INFORMATIONAL SUBMITTALS**

- A. Manufacturer Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required. In addition:
  1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
  2. Include statement that materials are compatible with adjacent materials proposed for use.
  3. Submit evidence indicating that field peel-adhesion test on all materials to which insulation are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.
- B. Field Quality Control Reports - Spray Thermal Insulation: Written report of testing and inspection required by "Field Quality Control".
- C. Warranty:
  1. Provide manufacturer written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions.

### **1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer with not less than 5 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.
- B. Installer Qualifications:
  1. Experience: Installer personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
  2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.
  3. Manufacturer Acceptance: Installer shall be certified, approved, licensed, or acceptable to manufacturer to install products.
- C. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

## 1.5 MOCK-UPS

- A. Mock-ups: Before overall installation of spray insulation, construct an on-site, in-place mockup as required to verify construction methods, demonstrate qualities of materials and execution and to facilitate site testing. Include all components in the assembly, including penetrations and attachments. Build mockups to comply with the following requirements, using exposed and concealed materials indicated for the completed Work.
1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.
    - a. Minimum size:
      - 1) Interior Side of Exterior Wall Assemblies: 10 ft. (3 m) wide by floor-to-floor height; include intersecting floor slab and one representative window.
      - 2) Underside of Elevated Slab: 10 ft. by 10 ft. (3 m by 3 m); replicate representative penetrations and perimeter conditions.
  2. Notify Architect, Third party Inspection Agency, and manufacturer's representative and testing agency 7 days in advance of the dates and times when mockups will be constructed.
  3. Obtain approval of mockups from Architect, Third Party Inspection Agency, and manufacturer's representative before proceeding with overall installation of insulation system.
  4. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.
  5. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.
  6. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.
- B. Phased, Two-Part Installations: Site mockup should be constructed in phases that include the following:
1. Phase 1: Complete installation of foam insulation at mock-up location.
  2. Phase 2: Complete installation of thermal barrier over foam installation.
  3. Testing and approvals shall be obtained for each phase prior to proceeding to the next phase or proceeding with overall installation of products.
- C. Detail Review of Perimeter Firestops at Floor Line: At floor line edge of perimeter firestop system inspect mock up for damage or deformation to firestop system by foam insulation expansion during installation. After foam has cured, cut out and remove foam at this area and inspect integrity of firestop. If foam has affected the integrity of the firestop provide sheet metal angle above firestop to prevent downward expansion of foam insulation.
- D. Testing for Adhesion: Test site mock-up of materials for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with ASTM D 4541. Material manufacturer has established a minimum adhesion level for the product on the particular substrate; the inspection report shall indicate whether this requirement has been met.
1. Include test area at window anchor system (adhesion to metal anchor).



- E. Sampling for Dimensional Stability: Coordinate with testing agency for removal of representative samples from the mock-up application for laboratory testing of foam insulation dimensional stability. Testing agency will perform test in accordance with ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging, except as modified herein:
1. Obtain dimensional stability test report from foam insulation manufacturer for specified foam insulation. Perform dimensional stability testing in accordance with ASTM D2126, date of standard as used for manufacturer's testing.
  2. Perform ASTM D2126 test procedure at exposure conditions listed in manufacturer's dimensional stability test report.
  3. Cut sample specimens from larger pieces of foam and immediately begin testing. Do not wait for "aging" period.
  4. Report change in mass and dimensions at 3 days and 28 days, in addition to the exposure time recommended in ASTM D2126.
  5. Photograph samples prior to conditioning and at each stage of testing procedure. Label and save photos according to date and sample number. Submit photographs and report data for review.
  6. Foam insulation will be deemed of acceptable quality if change in volume (dimensional stability) does not exceed, by shrinkage or expansion, the manufacturers reported foam insulation percent volume change.

## **1.6 PRE-INSTALLATION CONFERENCE**

- A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.
1. Participants:
    - a. Architect.
    - b. Contractor, including superintendent.
    - c. Installer, including project manager and supervisor.
    - d. If requested, Manufacturer's qualified technical representative.
    - e. Installers of other construction interfaced with Work.
    - f. If requested, testing and inspection agencies.
  2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:
    - a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
      - 1) Review ventilation or "fresh air" requirements.
    - b. Review Contract Document requirements.
    - c. Review approved submittals of details for the following conditions:
      - 1) Firestopping sealant slab edge
      - 2) Head, sill and jambs of punched windows.
      - 3) Expansion joints, penetrations, roof and terminations.
      - 4) Intersecting framing members.

- d. Review construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction.
    - 1) Review requirements of substrate to be dry and procedures to achieve this.
    - 2) Review adjacent surface protection and clean-up procedures and materials.
    - 3) Review procedures to remedy voids that are identified after installation.
  - e. Review inspection and testing requirements.
  - f. Review environmental conditions and procedures for coping with unfavorable conditions.
  - g. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.
3. Record discussions, including decisions and agreements, and prepare report.

### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original packages or containers with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
- C. Protect against ignition at all times. Minimize the time that insulating materials are stored at project site before installation.

### **1.8 PROJECT CONDITIONS**

- A. Temperature and humidity: Install within ambient temperature and humidity range and substrate temperatures recommended by foam insulation and thermal barrier manufacturers. Do not apply to a damp or wet substrate.
- B. Field Conditions: Do not install in snow, rain, fog, or mist.

### **1.9 COORDINATION**

- A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

### **1.10 WARRANTY**

- A. Manufacturer Warranty: Furnish manufacturer's written material and labor warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials and labor required to repair or replace work which exhibits material defects caused by manufacture or design of product. "Defects" are defined to include but not limited to deterioration or failure to perform as required.
  - 1. Warranty Period: Manufacturer shall warrant the products to be free from material and labor Defects for the period stated below commencing from date of Substantial Completion
    - a. Foam Insulation: 10 years.

- b. Thermal Barrier: 2 years.
- B. Installer Warranty: Furnish installer's written workmanship warranty signed by an authorized representative using installer's standard form agreeing to provide labor required to repair or replace work which exhibits workmanship defects. "Defects" is defined to include but not limited to deterioration or failure to perform as required.
  - 1. Warranty Period: Installer shall warrant the installation to be free from workmanship Defects for a period of 2 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS AND PRODUCTS**

- A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".
- B. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.
  - 1. Foam Insulation:
    - a. NCFI Polyurethanes; InsulBloc.
    - b. BASF; WALLTITE US.
    - c. Demilec (USA) LLC; HEATLOK Soy 200 Plus.
    - d. JM Johns Manville; JM CORBOND III.
  - 2. Thermal Barrier:
    - a. Thin-Film Intumescent Thermal Barrier: Demilec (USA) LLC; Blazelok TBX.
    - b. Thin-Film Intumescent Thermal Barrier: Flame Control Coatings; Flame Control No. 60-60A.
    - c. Spray-Applied Cellulose Thermal Barrier: International Cellulose Corporation; Ure-K Thermal Barrier System.

### **2.2 MATERIALS, GENERAL**

- A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

### **2.3 PERFORMANCE REQUIREMENTS**

- A. Foam Insulation: Materials shall meet or exceed the following performance requirements as indicated in the test reports.
  - 1. Aged R-value: Minimum 6.2 per in (per 25 mm), per ASTM C518.
  - 2. Density: Nominal 2 lb/cu. ft. (24 kg/cu. m), per ASTM D1622.
  - 3. Surface-Burning Characteristics: When tested according to ASTM E 84:
    - a. Flame Spread: Less than 25.

- b. Smoke Developed: Less than 450.
  - 4. Fire Propagation Characteristics: Passes both NFPA 259 and NFPA 285 testing as part of an approved assembly.
  - 5. Movement: Accommodate movements of building materials, capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, doesn't displace adjacent materials, and allows for the relative movement of assemblies due to thermal and moisture variations and creep, and anticipated movement.
- B. Thermal Barrier: Provide thermal barrier coatings, including primer and topcoats if required, with thermal barrier response characteristics indicated, as determined by testing identical products according to test method by testing agency indicated below. Identify containers containing thermal barrier coatings with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: When tested according to ASTM E 84:
    - a. Flame Spread: Less than 25.
    - b. Smoke Developed: Less than 450.
  - 2. ASTM E119/UBC 26-2 Test Method for the Evaluation of Thermal Barriers.
    - a. Thermal Rating over Foam Insulation: 15 Minutes.
  - 3. Bond Strength Minimum: 280 psi (1931 k Pa) per ASTM D 4541.
  - 4. Hazardous Substances: Provide products containing no detectable asbestos.

## 2.4 THERMAL BARRIER

- A. Material Compatibility: Thermal barrier and primer or topcoat products shall be compatible with one another and with substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and laboratory analysis.
- B. Usage Limitation: Thermal barrier coatings may be applied only in exposure environments listed in thermal barrier assembly design selected. Coatings rated for interior exposures shall not be applied in exterior exposures.
- C. Spray-Applied Intumescent Thermal Barrier Coating: Manufacturer's standard factory-mixed formulated, multi-coat system of products complying with thermal barrier performance requirements.
  - 1. Primer for Interior Applications: Product selected from Intumescent thermal barrier manufacturer's list of acceptable primers or provided by manufacturer.
  - 2. Intumescent Coating: Single or multiple component coating that when applied is a relatively thin, paint-like film but when exposed to fire forms a thick, puffy, inert, charred-surface protectant that thermally insulates spray polyurethane.
  - 3. Topcoat for Interior Applications: (If required by manufacturer/installer) Product selected from Intumescent thermal barrier manufacturer's list of acceptable topcoats or provided by manufacturer. Provide only as required by manufacturer for additional protection based on actual site conditions.

D. Spray-Applied Cellulose Thermal Barrier Coating: Manufacturer's standard factory-mixed formulated, single-coat system of cellulosic coating fibers combined with a binder or liquid adhesive. Products shall comply with complying thermal barrier performance requirements.

1. Primer for Interior Applications (if required by manufacturer): Product selected from cellulose thermal barrier manufacturer's list of acceptable primers or provided by manufacturer.

## **2.5 AUXILLARY MATERIALS**

A. Sprayed Foam Insulating Gap Filler:

1. Description: Low pressure, one-component, expanding, closed-cell polyurethane insulating foam gap filler; applied with professional hand-held dispensing gun; CFC and HCFC free.
2. Performance Requirements: Class 1 Fire-Retardant per ASTM E 84.
3. Manufacturers and Products:
  - a. BASF; Foam Sealant.
  - b. Dow Chemical Co.; Great Stuff Pro.

B. Metal Angle at Firesafing (Required usage based on Mock-Up Review): 0.1875 in (4.8 mm) thick aluminum or galvanized steel angle.

C. Precast Joint Materials: Provide one of the following options:

1. Manufacturer recommendation.
2. Additional backer rod. Refer to Division 07 Section Joint Sealants.
3. Release Tape: 0.006 in (0.15 mm) thick polyethylene tape, adhesive backed on one side, width as required.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

A. Acceptance of Surfaces and Conditions: Examine substrates to which thermal insulation will be applied, with Installer present, for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting Work within a particular area will be construed as acceptance of surface conditions.

1. If applying to cast-in-place concrete, do not proceed with installation until after minimum concrete curing period recommended by insulation manufacturer.
2. Ensure that the following conditions are met:
  - a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
  - b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263 until substrate passes.

### **3.2 INSTALLATION, GENERAL**

- A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:
1. Manufacturer current Evaluation Service Report (ESR) as issued by International Code Council (ICC-ES) and written installation instructions.
  2. Accepted submittals.
  3. Contract Documents.
  4. Mock-Up Review and Approval.

### **3.3 PREPARATION**

- A. General: Comply with manufacturer instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall be clean, dust-free, dry and have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.
1. Ensure that penetrating work by other trades is in place and complete.
  2. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the spray polyurethane foam.
  3. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam.
  4. Verify that precast anchors are in place.
- B. Protection from Spray Applied Materials:
1. Mask and cover adjacent areas to protect from overspray.
  2. Ensure any required foam stop or back up material are in place to prevent overspray and achieve complete seal.
  3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
  4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

### **3.4 INSTALLATION OF INSULATION SYSTEMS**

- A. Sprayed Foam Insulating Gap Filler: Apply sprayed foam insulating gap filler within area indicated on drawings using professional hand-held dispensing gun in accordance with manufacturer's written instructions.
1. Prior to installation of foam insulation, apply sprayed foam insulating gap filler to gaps, cracks, cavities, openings, and voids in substrate including annular space around piping, ducts, conduits, wiring, and electrical outlets to seal off potential air drafts.
  2. Apply sprayed foam insulating gap filler to window mullions after final application of sprayed materials, as indicated on drawings.
  3. After sprayed foam sealant is applied, make flush with face of adjacent wall by using method recommended by manufacturer.
- B. Termination Details (if required based on evaluation and approval of Mock-Up): Install metal angle at intersection of floor slab and precast concrete panels,

1. Install metal angle above firesafing to provide a mechanically fastened edge restraint for the foam insulation. Fasten top leg of metal angle to backside of precast panel wall. Ensure bottom leg of metal angle covers entire area of firesafing. Fasten bottom leg of metal angle to concrete floor slab. Do not terminate foam insulation on firesafing. Fill any gaps between metal angle and firestop with sprayed foam insulating gap filler.
- C. Precast Panel Joints: Treat panel joints by one of the methods as indicated below based on manufacturer recommendation for installation of foam insulation:
1. Method as recommended by foam insulation manufacturer.
  2. Install additional backer rod at precast joints prior to application of foam insulation.
  3. Install 3 in (75 mm) wide release tape over precast joints prior to application of foam insulation.
- D. Spray Application: Install materials in accordance with manufacturer's recommendations and the following:
1. Equipment used shall comply with the manufacturer recommendations for the specific type of application. Record equipment settings on the Daily Work Record as required by the submittals. Each proportioned unit shall supply only one spray gun.
  2. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.
  3. Foam Insulation: Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 1/2 in (12 mm) and not greater than 2 in (50 mm). An additional pass shall only be done after the first pass has had time to cool down.
    - a. Apply material in thicknesses not less than those required to achieve minimum R-value indicated.
  4. Install within manufacturer tolerances, but not more than minus 1/4 in (6 mm) or plus 1/2 in (12 mm).
  5. Do not install within 3 in (75 mm) of heat emitting devices such as light fixtures.
  6. Finished surface of sprayed materials to be free of voids and embedded foreign objects.
  7. Trim, as required, any excess thickness that would interfere with the application of covering system by other trades.
  8. Cure sprayed materials according to manufacturer recommendations to prevent premature drying.

### **3.5 FIELD QUALITY CONTROL**

- A. Manufacturer Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.
1. Manufacturer Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.
- B. Testing Agency: Employ and pay a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor expense.

1. Thickness: Perform a minimum of one test for each 500 sf (150 sm) area, or partial area, per ASTM E 605.
2. Density: Perform minimum of two tests per ASTM E 605.
3. Bond Strength: Perform minimum of two cohesion and adhesion tests, per ASTM E 736.
4. Shrinkage: Dimensional Stability laboratory testing of foam insulation.
5. If testing finds applications of foam insulation material are not in compliance with requirements, perform additional random testing to determine extent of noncompliance.
6. Remove and replace applications of foam insulation material where test results indicate that it does not comply with specified requirements for cohesion and adhesion and density.
7. Apply additional material per manufacturer written instructions where test results indicate that thickness does not comply with specified requirements.
8. Patch areas where samples have been removed to maintain insulation thickness.

C. Contractor Responsibilities:

1. Proceed with application for next area only when test and inspection results for previously completed applications show compliance with specified requirements. Tested values must equal or exceed values required for each approved assembly design.
2. Remove and replace applications where test and inspection results indicate it does not comply with specified requirements.
3. Apply additional coatings where test and inspection results indicate application does not comply with specified requirements.
4. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements at Contractor expense.

### **3.6 PROTECTION AND CLEANING**

- A. Protection: Protect from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where installed product is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation
- B. Cleaning: Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

**END OF SECTION**



## SECTION 07 7200

### ROOF ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Roof accessories and supplementary items necessary for installation of the following:
  - 1. Roof curbs.
  - 2. Equipment supports.
  - 3. Heat and smoke vents.
  - 4. Rooftop pipe supports.
  - 5. Precast concrete splash blocks.
  - 6. Snow guards.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: Manufacturer's technical literature for each product and system indicated.
  - 1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.
- B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work. Indicate dimensions, loadings, and special conditions.
- C. Samples for Initial Selection: Submit for each exposed product with factory-applied color finishes in each color and texture specified, prepared on Samples of size to adequately show color.
- D. Samples for Verification Purposes: Submit for each type of exposed finish required, prepared on Samples in manufacturer's standard sizes, and of same thickness and material indicated for the Work. If finishes involve normal color or shade variations, include sample sets showing the full range of variations expected.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Field Quality Control Reports for Snow and Ice Melt System: Written report of testing and inspection required by "Field Quality Control".
- B. Snow and Ice Melt System Manufacturer's Project Acceptance Document: Certification by the manufacturer that its products and systems are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.
- C. Qualification Data:
  - 1. For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects.

- D. Warranty: Sample of warranty.
  - 1. Provide manufacturer's written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: To include in maintenance manuals.

#### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer with not less than 10 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.
- B. Installer Qualifications for Snow and Ice Melt System:
  - 1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
  - 2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.
  - 3. Manufacturer Acceptance: Installer shall be certified, approved, licensed, or acceptable to manufacturer to install products.

#### **1.6 PRE-INSTALLATION CONFERENCE**

- A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.
  - 1. Participants:
    - a. Architect.
    - b. Contractor, including superintendent.
    - c. Installer, including project manager and supervisor.
    - d. If requested, Manufacturer's qualified technical representative.
    - e. Installers of other construction interfaced with Work.
  - 2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:
    - a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
    - b. Review Contract Document requirements.
    - c. Review approved submittals.
    - d. Review inspection and testing requirements.
    - e. Review environmental conditions and procedures for coping with unfavorable conditions.
    - f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.
  - 3. Record discussions, including decisions and agreements, and prepare report.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver roof accessories to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, and date of manufacture.
- B. Protect roof accessories from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- C. Handle, store, and install roof accessories in a manner to avoid permanent deflection of roof deck.

## **1.8 COORDINATION**

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

## **1.9 WARRANTY**

- A. Manufacturer's Warranty for Roof Hatches and Smoke Vents: Furnish manufacturer's written material warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials required to repair or replace work which exhibits material defects caused by manufacture or design of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge to the Owner.
  - 1. Warranty Period: Manufacturer shall warrant the products to be free from material defects for a period of 5 years from date of Substantial Completion.
- B. Manufacturer's Warranty for Snow and Ice Melt System: Furnish manufacturer's written material warranty signed by an authorized representative using manufacturer's standard form agreeing to furnish materials required to repair or replace work which exhibits material defects caused by manufacture or design of product. "Defects" is defined to include but not limited to deterioration or failure to perform as required.
  - 1. Warranty Period: Manufacturer shall warrant the products to be free from material defects for a period of 2 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".
- B. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

- C. Basis of Design (Product Standard): Contract Documents are based on products and systems specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.

## **2.2 MATERIALS, GENERAL**

- A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

## **2.3 PERFORMANCE REQUIREMENTS**

- A. General Performance: Installed roof accessories 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. Standards: Comply with the following:
  - 1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
  - 2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

## **2.4 METAL MATERIALS**

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653 / A 653M, G90 (Z275) coating designation.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792 / A 792M, AZ50 (AZM150) coated.
- C. Steel Tube: ASTM A 500, round tube.
- D. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123 / A 123M.
- E. Galvanized Steel Pipe: ASTM A 53/A 53M, hot-dip galvanized according to ASTM A 123 / A 123M.

## **2.5 MISCELLANEOUS MATERIALS**

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Treated Wood Nailers: As specified in Division 06 Section "Miscellaneous Rough Carpentry".
- C. Security Grilles: 3/4 in (19 mm) diameter, ASTM A 1011 / A 1011M steel bars spaced 6 in (150 mm) on center in one direction and 12 in (300 mm) on center in the other; factory finished as follows:
  - 1. Surface Preparation: Remove mill scale and rust, if any, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling".
  - 2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.

3. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats under prolonged exposure.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mils (0.762 mm) thickness per coat.
  - E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
    1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153 / A 153M or ASTM F 2329.
  - F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
  - G. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
  - H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
  - I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
  - J. Underlayments:
    1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
    2. Polyethylene Sheet: 6 mils (0.15 mm) thick polyethylene sheet complying with ASTM D 4397.
    3. Slip Sheet: Building paper, 3 lb/100 sf (0.16 kg/sm) minimum, rosin sized.

## 2.6 ROOF CURBS

- A. Insulated Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.
  1. Manufacturers:
    - a. Custom Solution Roof and Metal Products.
    - b. Pate Company.
    - c. Roof Products, Inc.
    - d. Thybar Corporation.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

- C. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.079 in (2 mm) thick. Factory prime coating finish.
- D. Construction:
  - 1. Insulation: Manufacturer's standard.
  - 2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
  - 3. Factory-installed treated wood nailer at top of curb, continuous around curb perimeter.
  - 4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
  - 5. Fabricate curbs to minimum height of 12 in (300 mm) unless otherwise indicated.
  - 6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
  - 7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
  - 8. Security Grille: Provide where indicated.

## **2.7 EQUIPMENT SUPPORTS**

- A. Insulated Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.
  - 1. Manufacturers:
    - a. Custom Solution Roof and Metal Products.
    - b. Pate Company.
    - c. Roof Products, Inc.
    - d. Thybar Corporation.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Material: Zinc-coated (galvanized) or Aluminum-zinc alloy-coated steel sheet, 0.079 in (2 mm) thick. Factory prime coating finish.
- D. Construction:
  - 1. Insulation: Manufacturer's standard.
  - 2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
  - 3. Factory-installed continuous treated wood nailers 3-1/2 in (87 mm) wide at tops of equipment supports.
  - 4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
  - 5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
  - 6. Fabricate equipment supports to minimum height of 12 in (300 mm) unless otherwise indicated.
  - 7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

## 2.8 HEAT AND SMOKE VENTS

- A. Heat and Smoke Vents: Manufacturer's standard, with double-walled insulated curbs, welded or mechanically fastened and sealed corner joints, integral condensation gutter, and cap flashing. Fabricate with insulated double-walled lid and continuous weathertight perimeter lid gaskets, and equip with automatic self-lifting mechanisms and UL-listed fusible links rated at 165 deg F (74 deg C) and coordinated with fire-suppression and smoke-detection systems.
1. Manufacturers:
    - a. Acudor Products, Inc.
    - b. Babcock-Davis.
    - c. Bilco Company.
    - d. Dur-Red Products.
    - e. J.L. Industries, Inc.
    - f. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
    - g. Nystrom Building Products.
  2. Type and Size: As indicated on the Drawings.
  3. Loads: Minimum 40 lbf/sf (1.9 kPa) external live load and 30 lbf/sf (1.4 kPa) internal uplift load.
    - a. When release is actuated, lid shall open against 10 lbf/sf (0.5 kPa) snow or wind load and lock in position.
  4. Heat and Smoke Vent Standard: Provide units that have been tested and listed to comply with UL 793 and are FMG Approved.
  5. Curb, Framing, and Lid Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.079 in (2.01 mm) thick.
  6. Construction:
    - a. Insulation: Manufacturer's standard.
    - b. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
    - c. Exterior Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
    - d. Fabricate curbs to minimum height of 12 in (300 mm), unless otherwise indicated.
    - e. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.
    - f. Security Grille: Provide where indicated.
  7. Hardware: Manufacturer's standard, corrosion resistant or hot-dip galvanized; with hinges, hold-open devices, and independent manual-release devices for inside and outside operation of lids.

## 2.9 ROOFTOP PIPE SUPPORTS

- A. Rooftop Supports for Piping, Conduit, Cable Tray or Equipment: Installation without requiring roof penetrations, flashing, or damage to the roofing material. Support bases and pipe rollers made of an engineered thermoplastic with appropriate additives for UV protection. All structural steel components hot-dipped galvanized. Height-adjustable supports must be used where necessary. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. Support base to have radiused

edge to enhance compatibility with roof membranes.

1. Load Capacity: Up to 1,500 lbs (680 kg).
- B. The rooftop strut support shall provide a fixed-height mounting platform of 4 or 6 inches (100 or 150 mm) off of the roof and a usable strut length of up to 10 or 16 inches (250 or 400 mm).
- C. The adjustable-height strut support shall allow elevations changes of up to 16 inches (400 mm) off of the roof and a usable strut length of up to 10 or 16 inches (250 or 400 mm).
- D. The rooftop roller support shall provide roller capacity for up to nominal 6 inches (150 mm) steel pipe with a minimum 5-1/2 inches (138 mm) fixed height off of the roof.
- E. The adjustable-height roller support shall provide roller capacity for up to nominal 6 inches (150 mm) steel pipe and accommodate elevation changes of up to 16 inches (400 mm) off of the roof. The rollers shall be polymeric. The roller axle, fittings and other hardware shall be manufactured of hot-dipped galvanized steel.
- F. Basis of Design: ERICO International Corporation; ST Series, Strut-based Thermoplastic Supports.

## **2.10 PRECAST CONCRETE SPLASH BLOCKS**

- A. Prefabricated units of reinforced Portland cement concrete, aggregates, admixtures, and water; shaped to divert water away from building. Minimum size: 12 in (300 mm) by 24 in (600 mm) by 3 in (75 mm) high. Weight: 50 lbs (22.6 kg). Provide protection layer below splash block to protect roofing system.

## **2.11 SNOW GUARDS**

- A. Snow Guards, General: Prefabricated, noncorrosive units designed to be installed without penetrating roofing system; complete with predrilled holes, clamps, or hooks for anchoring. Snow guards materials and mounting method shall be fully compatible with adjacent roofing system to avoid any damage or penetrations which may compromise the integrity of the system.
- B. Surface-Mounted, Plastic, Stop-Type Snow Guards: Clear polycarbonate stops designed for attachment to panel surface of roofing system using construction adhesive, silicone or polyurethane sealant, or adhesive tape.
- C. Surface-Mounted, Metal, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to panel surface of roofing system using construction adhesive, silicone or polyurethane sealant, or adhesive tape.
- D. Seam-Mounted, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to vertical ribs of standing-seam sheet metal roofing with stainless-steel set screws.
- E. Seam-Mounted, Bar-Type Snow Guards: Rail- or fence-type assembly consisting of mill-finished aluminum or stainless-steel rods, bars, or pipe held in place by stainless-steel clamps attached to vertical ribs of standing-seam sheet metal roofing.
- F. Surface-Mounted, Copper, Stop-Type Snow Guards: Bronze-alloy stops designed for attachment to panel surface of copper roofing using solder.
- G. Manufacturers:



1. Alpine SnowGuards, a division of Vermont Slate & Copper Services, Inc.
2. Berger Building Products.
3. Chemlink, Inc.
4. LMCurbs
5. Polar Blox.
6. Precision Molding Co., Inc.
7. Snoblox / Snojax Inc.
8. Sno-Gem, Inc.
9. TRA Mage Inc.
10. Zaleski Snow-Guards & Roofing Specialties

## **2.12 GENERAL FINISH REQUIREMENTS**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" 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 accepted Samples and are assembled or installed to minimize contrast.

## **2.13 GALVANIZED STEEL SHEET FINISHES**

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
  1. Color and Gloss: As selected by Architect from manufacturer's full range.
  2. Color: As scheduled or as indicated in Design Selections.
  3. Baked-Enamel:
- C. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

### **3.2 INSTALLATION, GENERAL**

- A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:
  - 1. Respective manufacturer's written installation instructions.
  - 2. Accepted submittals.
  - 3. Contract Documents.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

### **3.3 PREPARATION**

- A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in **Work**.

### **3.4 INSTALLATION OF ROOF ACCESSORIES**

- A. General: Install and securely anchor roof accessories directly to structural supporting deck or substrate (not on top of wood blocking) so they are capable of resisting indicated loads.
  - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
  - 2. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  - 3. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous paint or by other permanent separation as recommended by manufacturer.
  - 1. Underlayments: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
  - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level, unless otherwise indicated.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Heat and Smoke Vent Installation:
  - 1. Install heat and smoke vent so top perimeter surfaces are level.
  - 2. Install and test heat and smoke vents and their components for proper operation according to NFPA 204.
- F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

- G. Rooftop Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.
  - 1. Provide complete and adequate support of all piping and conduit, whether or not all required devices are shown.
  - 2. The use of wood for supporting piping is NOT permitted.
  - 3. Provide supports spaced so deflection of piping does not exceed 1/240 of span.
  - 4. Isolation Pads: Consult manufacturer of existing or new roofing system as to the type of isolation pads required between the roof and support. Set isolation pads in adhesive if required by manufacturer's instructions. Place supports on isolation pads.
- H. Precast Concrete Splash Blocks: Install splash block at outlet locations of downspouts. Set splash block over protection layer to protect roofing system.
- I. Stop-Type Snow Guards: Attach snow guards to roofing system with adhesive or adhesive tape, as recommended by manufacturer. Do not use fasteners that will penetrate roofing system. Install snow guards in layout, spacing, and pattern indicated on the Drawings.
- J. Bar-Type Snow Guards: Attach bar supports to vertical ribs of metal roofing system with clamps or set screws. Do not use fasteners that will penetrate roofing system. Install snow guards in layout, spacing, and pattern indicated on the Drawings.
- K. Snow and Ice Melt Systems: Install in accordance with manufacturer's written installations at layout, spacing, pattern and locations indicated on the Drawings. Coordinate the complete snow and ice melt system installation with the gutter, roofing, and flashing installations.

### **3.5 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.
  - 1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.

### **3.6 REPAIR AND CLEANING**

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- E. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.

**END OF SECTION**

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**SPRAYED FIRE-RESISTIVE MATERIALS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Sprayed fire-resistive materials (SFRM) and supplementary items necessary for installation.

**1.2 DEFINITIONS**

- A. SFRM: Sprayed Fire-Resistive Materials.
- B. Concealed: Not visible; hidden by other construction.
- C. Exposed: Visible, not hidden by other construction.
- D. Direct Moisture: Exposed to wetness, surfaces normally soaked, saturated or regularly exposed to water and or moisture.

**1.3 ACTION SUBMITTALS**

- A. Fire-Rated Assembly Design Classification: Submit documentation issued by testing agency for each fire-rated assembly design selected.
- B. Product Data: Manufacturer's technical literature for each product and system indicated.
  - 1. Include manufacturer's specifications for materials, finishes, construction details, installation instructions, and recommendations for maintenance.
- C. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components and attachments to other work. Distinguish between shop and field-assembled work.
  - 1. Source: Submit one of following:
    - a. Shop drawings specifically prepared by fire-resistive materials applicator with required information.
    - b. Structural steel fabricator's erection plans with required information hand-marked and color-coded.
  - 2. Required Information:
    - a. Show requirements for steel surface preparation.
    - b. Identify locations for each fire-rated assembly design selected.
    - c. Indicate minimum fire-resistive material thicknesses needed to achieve required fire-ratings for each structural member.

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**1.4 INFORMATIONAL SUBMITTALS**

- A. Manufacturer's Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.
- B. Field Quality Control Reports: Written report of testing and inspection required by "Field Quality Control".

**1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Manufacturer with not less than 5 years of experience in the successful production and in-service performance of products and systems similar to scope of this Project.
- B. Installer Qualifications:
  - 1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
  - 2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project
- C. Compatibility and Adhesion Test Reports: Written reports indicating fire-resistive material components, including primers, have been tested for bond with steel substrates and between each other.
  - 1. Test for bond according to ASTM E 736 and requirements in UL's "Fire Resistance Directory" for fire-resistive materials.
  - 2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers to be incompatible with fire-resistive materials.
- D. Patching Plan: Written plan detailing materials and methods to be used for patching of fire-resistive materials damaged during construction.
- E. Fire-Test-Response Characteristics: Provide fire-resistive materials with fire-test-response characteristics indicated, as determined by testing identical products according to test method by testing agency indicated below, or listing of other testing agency acceptable to authorities having jurisdiction. Identify bags containing fire-resistive materials with appropriate markings of applicable testing and inspecting agency.
- F. Fire-Resistance Ratings: Tested according to UL 263/ASTM E 119/NFPA 251 under Category CHPX published in UL's "Fire Resistance Directory" for Spray-Applied Fire-Resistive Materials.
- G. Surface-Burning Characteristics: When tested according to ASTM E 84:
  - 1. Flame Spread: Less than 25.
  - 2. Smoke Developed: Less than 450.

**1.6 PRE-INSTALLATION CONFERENCE**

- A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.
  - 1. Participants:

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- a. Architect.
  - b. Contractor, including superintendent.
  - c. Installer, including project manager and supervisor.
  - d. If requested, Manufacturer's qualified technical representative.
  - e. Installers of other construction interfaced with Work.
2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:
- a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
  - b. Review Contract Document requirements.
  - c. Review approved submittals.
  - d. Review inspection and testing requirements.
  - e. Review environmental conditions and procedures for coping with unfavorable conditions.
  - f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.
3. Record discussions, including decisions and agreements, and prepare report.

**1.7 PROJECT CONDITIONS**

- A. Environmental Requirements: Comply with manufacturer's recommendations for temperature and ventilation requirements during and after application.
- B. Work Sequence Requirements:
1. Metal Floor Deck: Apply fire-resistive materials after concrete topping has been completed.
  2. Metal Roof Deck: Apply fire-resistive materials after concrete topping and roofing installation has been completed.
  3. Personnel Traffic: Prohibit on floor and roof above during application and drying of fire-resistive materials.
  4. Accessories: Apply fire-resistive materials after steel stud framing, clips, hangers, supports, sleeves, and other items are in place.
  5. Suspended Components: Defer installing ducts, piping, and other items that would interfere with applying fire-resistive materials until after application.
- C. Protection During Work: Provide temporary enclosure as required for following:
1. Confine spraying operations and protect environment.
  2. Prevent deterioration of fire-resistive materials due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
  3. Prevent unnecessary abrasion and other damage likely to occur during construction operations subsequent to application.

**1.8 COORDINATION**

- A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.

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**1.9 WARRANTY**

- A. Installer's Warranty: Furnish installer's written workmanship warranty signed by an authorized representative using installer's standard form agreeing to provide labor required to repair or replace work which exhibits workmanship defects. "Defects" is defined to include but not limited to deterioration or failure to perform as required.
1. Coverage of warranty includes but is not limited to the following:
    - a. Defects or deterioration.
    - b. Cracking, flaking, or spalling.
    - c. Peeling or delaminating from substrates.
    - d. Failure to remain bonded.
    - e. Erosion in excess of specified requirements.
    - f. Faulty application.
  2. Exclusions: Not covered are failures due, but not limited to, following:
    - a. Damage by occupants and Owner's maintenance personnel.
    - b. Exposure to environmental conditions other than those investigated and approved during fire-response testing.
    - c. Other causes not reasonably foreseeable under conditions of normal use.
  3. Warranty Period: Installer shall warrant the installation to be free from workmanship Defects for a period of 2 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS AND PRODUCTS**

- A. Acceptable Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, provide product by one of manufacturers listed. If not listed, submit as substitution according to the Conditions of the Contract and Division 01 Section "Substitution Procedures".
- B. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.

**2.2 MATERIALS, GENERAL**

- A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

**2.3 PRIMARY MATERIALS**

- A. Fire-Rated Assembly Design: Selected from Product Category BXUV published in UL's "Fire Resistance Directory" for sprayed fire-resistive materials, or design of other testing agency acceptable to authorities having jurisdiction.
- B. Material Compatibility: Primer and sprayed fire-resistive materials shall be compatible with one another and with substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and laboratory analysis.



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- C. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design.
  - 1. Products mixed at Project site to form a slurry or mortar before conveyance and application.
  - 2. Absence of Asbestos: Containing no detectable asbestos as determined according to method specified in 40 CFR 763, Subpart E, Appendix E, Section 1.
- D. Minimum Physical Properties: Following values unless higher value required by fire-rated assembly design selected.
- E. Minimum Dry Density: Average and individual densities, unless density indicated in fire-rated assembly design selected is greater according to ASTM E 605:
  - 1. Low-Density – Gypsum Binder: 15 pcf (240 k/cu m).
  - 2. Medium-Density - Gypsum Binder: 18 pcf (288 k/cu m).
  - 3. Medium-Density – Cement Binder: 22 pcf (352 k/cu m).
  - 4. High-Density – Cement Binder: 40 pcf (640 k/cu m).
- F. Thickness: Minimum average thickness as required by fire-rated assembly design selected according to ASTM E 605.
- G. Minimum Bond Strength: As follows according to ASTM E 736:
  - 1. Buildings Under 75 ft (22.5 m) in Height: 150 psf (7 kPa).
  - 2. Buildings Between 75 and 420 ft (126 m) in Height: 430 psf (21 kPa).
  - 3. Buildings Over 420 ft (126 m) in Height: 1,000 psf (48 kPa).
- H. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
- I. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
- J. Effect of Impact on Bonding: No cracking, spalling, delamination, per ASTM E 760.
- K. Air Erosion: Maximum weight loss of 0.025 grams per square foot in 24 hours according to ASTM E 859.
- L. Combustion Characteristics: Passes ASTM E 136 or ASTM E 1354.
- M. Fungal Resistance: No observed growth on specimens according to ASTM G 21.
- N. Signal Color for Renovation Work: Incorporate dye in mix to distinguish new work from existing coated surfaces.

**2.4 SPRAYED-FIRE RESISTIVE MATERIALS**

- A. SFRM-01 - Low-Density; minimum bond strength of 150 psf (7 kPa).
  - 1. Interior Locations: Unless a higher bond strength SFRM is scheduled below.
    - a. Concealed conditions for buildings under 75 ft (22.5 m) in height.
  - 2. Manufacturers and Products:

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- a. Carboline Co., Fireproofing Products Div.; Pyrolite 15 or Pyrolite 15 High-Yield.
  - b. GCP Applied Technologies; Monokote MK-6.
  - c. Isolatek International; Cafco 300 or Cafco 300 AC.
- B. SFRM-04 - Medium Density, Portland Cement Binder; minimum bond strength of 1,000 psf (48 kPa):
- 1. Interior Locations: Unless a higher bond strength SFRM is scheduled below.
    - a. Exposed columns.
    - b. Exposed structure in mechanical/electrical rooms and elevator shafts.
    - c. Exposed conditions subject to abrasion or humidity.
  - 2. Manufacturers and Products:
    - a. Carboline Co., Fireproofing Products Div.; Pyrocrete 239.
    - b. GCP Applied Technologies; Monokote Z106/HY.
    - c. Isolatek International; Cafco 400.
    - d. Southwest Fireproofing Products Co., Inc.; Type 7GP.
- C. SFRM-05 - High-Density, Portland Cement Binder; minimum bond strength of 10,000 psf (480 kPa).
- 1. Interior or Exterior Locations:
    - a. Exterior conditions.
    - b. Exposed conditions subject to impact or direct moisture.
  - 2. Manufacturers and Products:
    - a. Carboline Co., Fireproofing Products Div.; Pyrocrete 40.
    - b. GCP Applied Technologies; Monokote Z146.
    - c. Isolatek International; Fendolite M-II.
    - d. Southwest Vermiculite Co., Inc.; 7HD.
- D. SFRM-R - Low-Density; minimum bond strength of 150 psf (7 kPA):
- 1. Interior Locations:
    - a. Renovation work and previously coated surfaces for buildings under 75 ft (22.5 m) in height.
  - 2. Manufacturers and Products:
    - a. Carboline Co., Fireproofing Products Div.; Retrolite 15.
    - b. GCP Applied Technologies; Retro-Guard RG.
    - c. Isolatek International; Cafco 300 SB.

**2.5 AUXILIARY MATERIALS**

- A. General: Provide auxiliary materials compatible with fire-resistive materials and substrates approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-rated assembly design selected.

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- B. Bonding Adhesive: If required, product provided by fire-resistive materials manufacturer for enhancing bond between substrate and fire-resistive materials.
- C. Patching Material: Product provided by fire-resistive materials manufacturer for patching damaged work.
- D. Substrate Conditioner Coating: If required, product provided by fire-resistive materials manufacturer for coating substrate prior to application complying with one of following:
  - 1. Bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on series of bond tests according to ASTM E 736.
  - 2. Identical to those used in approved fire-rated assembly design.
- E. Reinforcements: One of following materials fabricated of weight, configuration, and finish required to comply with fire-rated assembly design selected and manufacturer's written recommendations; include clips, accessories, and other anchorage devices required to attach reinforcement to substrates scheduled to receive fire-resistive materials:
  - 1. Expanded metal lath.
  - 2. Steel pins.
  - 3. Glass fiber or polypropylene fabric mesh.
- F. Sealer: Provide where required, suitable for application over applied sprayed fire-resistive material; of type recommended in writing by fireproofing manufacturer for each fire-resistive design.
- G. Topcoat: Provide where required, suitable for application over applied sprayed fire-resistive material; of type recommended in writing by fireproofing manufacturer for each fire-resistive design.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.

**3.2 INSTALLATION, GENERAL**

- A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:
  - 1. Respective manufacturer written installation instructions.
  - 2. Accepted submittals.
  - 3. Contract Documents.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

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**3.3 PREPARATION**

- A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.
  - 1. Protection of Adjacent Work: Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
  
- B. Substrate Conditions: Coordinate substrate preparations with Division 05 Section "Structural Steel".
  - 1. Clean substrates of substances that have potential of impairing bond of fire-resistive materials, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, incompatible primers, paints, identification markings, and encapsulants as recommended by fire-resistive material manufacturer.
  - 2. Objects penetrating fire-resistive materials, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  - 3. Substrates are not obstructed by ducts, piping, equipment, walls, and other suspended construction that will interfere with application of fire-resistive materials.
  - 4. If steel has been coated with paint or primer, manufacturer shall determine if paint or primer has to be removed, or if fire-resistive materials can be applied without removal. If additional materials are required, include at no additional cost to Owner.
  
- C. Substrate Repair for Exposed Applications: Remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire-resistive materials. Remove minor projections and fill voids that would telegraph through fire-resistive materials after application.

**3.4 INSTALLATION**

- A. Application Procedures: Apply fire-resistive materials in thicknesses and densities required to achieve each fire-rated assembly design selected.
  - 1. Comply with manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey and spray fire-resistive materials, as applicable to particular conditions of installation and as required to achieve fire-rated assembly design selected.
  - 2. Where required, coat substrates with bonding adhesive or substrate primers before applying fire-resistive materials.
  - 3. Spray fire-resistive materials to maximum extent possible, then complete coverage by trowel application or other placement method recommended in writing by manufacturer.
  - 4. Maintain profile of substrates.
    - a. Reinforcement: Do not maintain profile of substrates where fire-resistive rating requires covering with reinforcement.
  - 5. Fill voids between members, including voids formed by corrugated and fluted decks above beams and similar voids.
  - 6. Reinforcement: Install reinforcement to comply with fire-rated assembly design selected and fire-resistive materials manufacturer's written recommendations for conditions of exposure and intended use. Securely attach to substrate in position required for support and reinforcement of fire-resistive materials. Use anchorage devices of type recommended in writing by fire-resistive materials manufacturer. Attach accessories where indicated or required for secure attachment to substrate.

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7. Exposed Applications: Provide uniform finish that is equivalent to approved mock-up.
  8. Cure fire-resistive materials according to fire-resistive materials manufacturer requirements.
- B. Patching: Under following conditions, remove sprayed fire-resistive materials and re-apply same sprayed fire-resistive materials as used for original application, or apply patching material:
1. Portions damaged, abraded, or removed by subsequent building construction.
  2. Previously applied materials determined by testing and inspection agency to be noncompliant.
- C. Sealers or Topcoats: Apply where required and as recommended in writing by fireproofing manufacturer for each application and fire-resistive design.

**3.5 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Manufacturer's qualified technical representative shall periodically inspect Work to ensure installation is proceeding in accordance with manufacturer's designs, recommendations, instructions, and warranty requirements. Representative shall submit written reports of each visit indicating observations, findings, and conclusions of inspection.
1. Manufacturer's Technical Representative Qualifications: Direct employee of technical services department of manufacturer with experience in providing recommendations, observations, evaluations, and problem diagnostics.
- B. Testing and Inspection Services: Owner will engage a qualified independent testing and inspection agency to perform field tests and inspections and to prepare test reports.
- C. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
1. Agency Responsibilities:
    - a. Agency personnel performing tests and inspections shall have not less than 3 years of experience in conducting field testing procedures.
    - b. Perform following tests and inspections according to local building code; if no building code requirements perform tests according to AWCI Technical Manual 12-A.
    - c. Required Testing and Inspections:
      - 1) Substrate Condition: Inspect to determine if substrates are prepared properly and comply with specified requirements; determine if substrate temperature at time of application is acceptable.
      - 2) Site Conditions during Application: Determine if temperature, humidity and other weather conditions comply with specified requirements.
      - 3) Test and inspect as required by Chapter 17 of the applicable building code entitled "Sprayed Fire-Resistant Materials".
      - 4) Patching: Inspect to determine if damaged substrates are properly patched to comply with approved fire-rated assembly design and approved patching plan submittal.

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- d. Reports shall contain not less than the information required by AWCI Technical Manual 12-A.
  - e. Interpret tests and inspections and state in each report whether applications comply with or deviate from specified requirements including, but not limited to, manufacturers product data and approved fire-rated assembly design.
  - f. If applications are found not in compliance with specified requirements perform additional random testing to determine extent of noncompliance at Contractor's expense.
  - g. Perform testing and inspecting to determine compliance of replaced, or additional work necessary because of noncompliant areas, with specified requirements at Contractor's expense.
2. Contractor's Responsibilities:
- a. Proceed with application for next area only when test and inspection results for previously completed applications show compliance with specified requirements. Tested values must equal or exceed values required for each approved fire-rated assembly design.
  - b. Remove and replace applications where test and inspection results indicate it does not comply with specified requirements.
  - c. Apply additional fire-resistive materials where test and inspection results indicate application does not comply with specified requirements.
  - d. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements at Contractor's expense.
- D. Fireproofing will be considered defective if it does not pass tests and inspections.
- 1. Remove and replace fireproofing that does not pass tests and inspections, and retest at Contractor's expense.
  - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest at Contractor's expense.
- E. Prepare test and inspection reports.

**3.6 PROTECTION**

- A. Protection: Protect fire-resistive materials from abrasion and damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of substantial completion.

**3.7 REPAIR**

- A. Coordination: Coordinate application of fire-resistive materials with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect fire-resistive materials and patch any damaged or removed areas. Repair or replace work that has not been successfully protected.

**END OF SECTION**

# Project Manual

Bid Package 02  
Addendum No.02  
Volume 2  
Divisions 25

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## Cherokee Nation WILMA P. MANKILLER HEALTH CENTER EXPANSION

Stilwell, Oklahoma

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January 27, 2020





Division	Section Title	Pages
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**PROCUREMENT AND CONTRACTING DOCUMENTS GROUP**

**SPECIFICATIONS GROUP**

*Facility Services Subgroup*

**DIVISION 25 - INTEGRATED AUTOMATION**

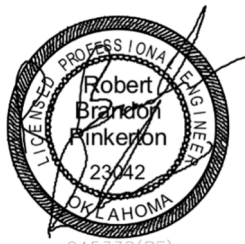
25 5050.1 CONTROLS ANALYTICS

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CA5338(PE)



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## **SECTION 25 5050.1**

### **CONTROLS ANALYTICS**

#### **PART 1 GENERAL**

- A. The ATC provider shall include the cost of all labor, tools, and subscriptions in order to provide the scope of services described in this section. Using data available from the control system, analytics shall be leveraged by ATC and energy professionals to identify performance trends and deviations from normal building operation, develop energy cost saving measures accordingly, and provide operational adjustment recommendations as well as risk assessments of the deviations as they relate to building reliability.

#### **PART 2 PRODUCTS**

- A. See Direct Digital Control System Specifications.

#### **PART 3 EXECUTION**

##### **3.1 HVAC SYSTEM PERFORMANCE SERVICE**

- A. Description

1. Shall provide data collection, analytics and professional analysis for general facility performance, airside systems , variable air systems and chiller performance including, but not limited to, analytics, charts and graphs which indicate both current building performance and opportunities for building and HVAC system performance improvement.

2. The ATC Contractor shall provide this service for a nominal period of one (1) year beginning on the date of substantial completion. The contractor shall provide a full report of the analytics four times throughout the first year. The report shall be presented by personnel trained in building analytics with appropriate professional credentials (P.E., CEM, etc...). In addition to the initial four reports in the first year after substantial completion, the ATC contractor shall provide pricing to extend this work into a second year with options for a single follow report, two follow up reports, or four follow up reports. The initial four reports shall follow the following scheme:
  - a. Report 1 – Approximately 3.5 months after the date of project substantial completion, should present analytics run on data collected from months 1 through 3 after substantial completion
  - b. Report 2 – Approximately 6.5 months after the date of project substantial completion, should present analytics run on data collected from months 4 through 6 after substantial completion.
  - c. Report 3 – Approximately 9.5 months after the date of project substantial completion, should present analytics run on data collected from months 7 through 9 after substantial completion
  - d. Report 4 – Approximately 12 months after the date of project substantial completion, should present analytics run on data collected from months 10 through 12 after substantial completion.

#### B. Service Performance Standards

##### 1. Data Collection Standards

- a. The Building Performance Service must be capable of:

- 1) Continuous collection of building interval data, 24 hours/day, 7 days/week
- 2) Remote access to building/system data, 24 hours/day, 7 days/week

2. Communication architecture shall allow data to be collected by hardwired, or wireless, direct connection to range of gateways including:

- a. Tridium (Niagara) platforms: JENE, JACE or other
- b. Tracer SC
- c. Trane Connectivity Module

3. HVAC System Performance Service shall use “push” technology to communicate with and send data to the central server, requiring limited outbound ports

4. Data shall be stored in a Class 5 secure hosting location protected by ISO 5001-complaint firewall and intrusion detection systems with support for major network security protocols such as HTTPS and SFTP to securely access and store data.

5. Professional Analysis Standards

a. Provider shall have trained personnel with relevant professional credentials in HVAC systems, energy management and building optimization methodologies to be able to:

- 1) Identify building system performance trends and deviations from normal operation
- 2) Prepare actionable recommendations to optimize HVAC system performance
- 3) Prepare recommendations for operational adjustments
- 4) Prepare risk analysis of emergency maintenance or failure
- 5) Develop Energy Conservation Measures (ECMs)

C. Mandatory HVAC System Performance Service Capabilities and Tests

1. For all of the analytics listed in this section, the Building Performance Service must be capable of indicating evidence of failures and exceptions that could result in energy savings or improved performance.

2. General Facility Analytic Capabilities shall include:

- a. Weather conditions at the actual building location
- b. Validation of the accuracy of outside air temperature and humidity sensors
- c. Identification of user-initiated overrides that could affect system performance

3. Outdoor Air Temperature and Relative Humidity Accuracy Test : Outdoor air temperature and relative humidity versus reference; the reference selection is auto-calculated based on the customer facility latitude and longitude. This test determines if the Outdoor Air Temperature and Relative Humidity sensors are accurate.

4. Airside System Analytics Capabilities Shall include:

- a. Constant volume operation

- b. Economizer damper status and operation
- c. Percentage of outside air used to ventilate the building
- d. Control of space temperature
- e. Ventilation control

#### 5. Economizer Operation Tests

- a. Air handling unit shall use mechanical cooling in lieu of economizer: this test indicates that the air-handling unit should have the capability to meet its cooling load by economizer alone. If this condition is detected, energy is being wasted and the opportunity to provide beneficial ventilation.
- b. Air handling unit controls making improper economizer decision: this test compares the calculated outdoor air intake percentage against the commanded economizer output percentage in order to identify improper economizer physical damper operation. This can detect outdoor air dampers stuck open or closed, both of which result in significant energy waste.

#### 6. Unitary System Tests

- a. Space, zone temperature versus setpoint: this test calculates the difference between the actual space, the zone temperature, and its setpoint. The defined averaged results are over a time range. In addition, this test detects excessively positive or negative space temperature control, which can result in approaching comfort and equipment service problems.
- b. Space, zone temperature versus setpoint: this test calculates the difference between the actual space temperature and its setpoint. The standard deviation of the resulting values is then calculated over a defined time range. This test detects erratic space temperature control that can result in approaching comfort and equipment service problems.

#### 7. 1.3.2.3 Ventilation Test

- a. Compares outdoor ventilation setpoint to measured value; this indicates that outdoor air ventilation is unacceptably low when compared to the setpoint.

#### 8. Variable Air Systems (VAS) Analytics capabilities shall include:

- a. Distribution of VAV box airflows
- b. Individual VAV box damper positions

- c. Comparison of the current position of a VAV box to the mean position for the variable air system

9. Supply air temperature control tests shall include:

- a. Building and Air-handling Unit Static Pressure Tests
- b. Supply air pressure setpoint versus measured value; this calculates the difference between the actual supply air pressure and the mean of the supply air pressure setpoint values over a defined time range. This test detects erratic static pressure control that can result in energy waste and acoustic problems.
- c. Systemic variable air volume box (VAV) position versus variable air system (VAS) mean; this identifies prolonged periods of time when VAV boxes in a VAS remain below the normal range, indicating that the fan speed was unnecessarily high. This test detects opportunities for the deployment of duct static pressure reset and associated energy savings.
- d. Supply air pressure setpoint versus measured value; this calculates the difference between the actual supply air pressure and the setpoint. In addition, it also calculates the standard deviation of the value over the defined time range. This test detects erratic static pressure control that can result in energy waste and acoustic problems.
- e. Building static pressure setpoint versus measured value; this calculates the difference between the measured space pressure and setpoint, and averages that value over the defined time range.
- f. Building static pressure setpoint versus measured value/erratic control; this calculates the difference between the measured space pressure and setpoint. In addition, it also calculates the standard deviation over the defined time range.
- g. Variable Air Volume Box Terminal Test
  - 1) Analyzes the behavior of individual VAV box positions during occupied periods: under normal circumstances, the majority of VAV box position samples should lie within their identified normal control range. Abnormal position proportions shall be a precursor to problems with space ventilation, comfort, and acoustics.

10. Chiller Data Analytics Capabilities shall include analysis of the following parameters:

- a. Operating mode

- b. Approach temperature
- c. Condenser water and chilled water flow status
- d. Chilled water temperature control
- e. Performance of compressor, condenser, evaporator, various motors, purge system
- f. Overview of oil system

#### 11. Chiller Equipment Tests

- a. Compare chilled water setpoint to actual leaving value: this poor chilled water control can be an indicator of many issues including approaching maintenance conditions, obvious energy waste, and process and comfort problems.
- b. Compare condenser water set point to actual leaving value: a poor condenser water control can be an indicator of many issues including approaching maintenance conditions and obvious energy waste due to poor efficiency.
- c. Compare chilled water pump status to flow system status: detecting stuck closed switch status can help prevent improper chiller operation, which can result in machine damage.
- d. Compare condenser pump status to actual flow status: detecting stuck closed switch status can help prevent improper chiller operation, which can result in machine damage.
- e. Compressor short cycle: this compares the operation of compressors over time and determine if they are operating properly per specification. Excessive compressor starts and stops can deteriorate the life of a compressor.
- f. Motor performance: this compares voltage, current, and temperature of motor versus specification on an ongoing basis. This can determine approaching maintenance requirement and prevent failures.
- g. Purge pump out: this demonstrates activity of purge activity and can be used to detect oncoming centrifugal breach problems.
- h. Evaporator efficiency: this maps the evaporator approach temperatures versus chiller load over time. In addition, it compares this data to as built chiller data, and is used to troubleshoot evaporator issues and predicting maintenance events.

- i. Condenser efficiency: this maps the condenser approach temperatures versus chiller load over time. In addition, it compares this data to as built chiller data and is used to troubleshoot evaporator issues and predicting maintenance events.

#### D. Analytics Reports

1. Failed test reports: reports can be requested from a library of failed tests. A report is generated and is placed in a system library each time a test fails. Each report is available in the various electronic formats.
2. Ad hoc retrieval of reports: these reports can be requested by user on an ad hoc basis. The user can select reports based on time and date range and output to various electronic formats.
3. Raw data reports; any data logged in the system can be accessed by the user. The user can select data based on time, date range, attribute and individual equipment or category of equipment.
4. Predefined reports: the user can select from a large library of reports based on time and date including the following:
  - a. Scheduling (inventory of time programs)
  - b. Override (inventory of user initiated override actions)
  - c. Equipment Inventory (listing of control automation and mechanical equipment)
  - d. Event and Alarms (topical events and alarms that have occurred in the facility)
  - e. Exceptions (listing of all detected failed test)

#### E. Professional Analysis Services

1. Initial Assessment shall include the baseline performance of the building.
2. HVAC system and equipment analysis shall diagnoses system performance against expectations for optimal operation and must indicate the following in order to assess the severity of the issue: most recent failure, count of failures and exceptions throughout building history for a particular point, most dramatic failure or exception for a particular point, first time the exception or failure was generated.

Energy analysis includes tracking monthly energy consumption for benchmarking purposes.



**END OF SECTION**