

- O. Provide a firestop system with an Assembly Rating as determined by UL 2079 that is equal to the time rating of construction being penetrated.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
  - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
  - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
  - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
  - 4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
  - 5. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 COORDINATION

- A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement for concrete.
- B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

### 3.3 INSTALLATION

- A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Director.
- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
  - 1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
  - 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
  - 3. Protect materials from damage on surfaces subjected to traffic.

### 3.4 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

### 3.5 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.6 FIRESTOPPING SCHEDULE

**BASED ON HILTI THROUGH PENETRATION FIRESTOP SYSTEMS**

CONCRETE			FLOORS			CONCRETE OR			BLOCK WALLS		
TYPE OF PENETRANT	F-RATING (HRS)	UL-CLASSIFIED SYSTEM	TYPE OF PENETRANT	F-RATING (HRS)	UL-CLASSIFIED SYSTEM	TYPE OF PENETRANT	F-RATING (HRS)	UL-CLASSIFIED SYSTEM	TYPE OF PENETRANT	F-RATING (HRS)	UL-CLASSIFIED SYSTEM
CIRCULAR BLANK OPENINGS	1	FA 0006, CAJ 0055, CAJ 0070	CIRCULAR BLANK OPENINGS	1	CAJ 0055, CAJ 0070	SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, FA 1017	SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, WJ 1021
	2	FA 0006, CAJ 0055, CAJ 0070		2	CAJ 1226, WJ 1021		2	CAJ 1226, WJ 1021			
	3	FA 0006, CAJ 0055		3	CAJ 1226, WJ 1041, WJ 1042		3	CAJ 1226, WJ 1041, WJ 1042			
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, FA 1017	SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT)	1	CAJ 2109, CAJ 2098, CAJ 2167	SINGLE OR BUNDLED CABLES	1	WJ 3036, CAJ 3095, CAJ 3096	CABLE TRAY	1	WJ 4016, CAJ 4034, CAJ 4035
	2	CAJ 1226, FA 1017		2	CAJ 2109, CAJ 2098, CAJ 2167		2	WJ 3036, CAJ 3095, CAJ 3096		2	CAJ 4034, CAJ 4035
	3	CAJ 1226, FA 1017		3	CAJ 2109, CAJ 2098		3	CAJ 3095, CAJ 3096		3	CAJ 4034, CAJ 4035
	4	CBJ 1037, CBJ 1034		4	WJ 2057		4	WJ 3050		4	WJ 8007
SINGLE NON-METALLIC PIPE OR CONDUIT	1	FA 2053, FA 2025, CAJ 2109, CAJ 2098, CAJ 2141, CAJ 2167, CBJ 2021	SINGLE OR BUNDLED CABLES	1	WJ 3036, CAJ 3095, CAJ 3096	CABLE TRAY	1	WJ 4016, CAJ 4034, CAJ 4035	SINGLE INSULATED PIPES	1	FA 5015, FA 5016, CAJ 5090, CAJ 5091, CAJ 5098
	2	FA 2053, FA 2025, CAJ 2109, CAJ 2098, CAJ 2141, CAJ 2167, CBJ-2021		2	WJ 3036, CAJ 3095, CAJ 3096		2	CAJ 5090, CAJ 5091, CAJ 5098		2	FA 5015, FA 5016, CAJ 5090, CAJ 5091, CAJ 5098
	3	FA 2054, CAJ 2109, CAJ 2098		3	CAJ 3095, CAJ 3096		3	FA 5016, CAJ 5090		3	FA 5016, CAJ 5090
SINGLE OR BUNDLED CABLES	1	FA 3007, CAJ 3095, CAJ 3096	SINGLE OR BUNDLED CABLES	1	WJ 3036, CAJ 3095, CAJ 3096	CABLE TRAY	1	WJ 4016, CAJ 4034, CAJ 4035	SINGLE INSULATED PIPES	4	CBJ 5006
	2	FA 3007, CAJ 3095, CAJ 3096		2	WJ 3036, CAJ 3095, CAJ 3096		2	CAJ 4034, CAJ 4035		4	CBJ 5006
	3	FA 3007, CAJ 3095, CAJ 3096		3	CAJ 3095, CAJ 3096		3	CAJ 4034, CAJ 4035		4	CBJ 5006
CABLE TRAY	1	CAJ 4034, CAJ 4035	CABLE TRAY	1	WJ 3050	CABLE TRAY	1	WJ 4016, CAJ 4034, CAJ 4035	ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017
	2	CAJ 4034, CAJ 4035		2	WJ 4016, CAJ 4034, CAJ 4035		2	CAJ 6006, CAJ 6017		2	CAJ 6006, CAJ 6017
	3	CAJ 4034, CAJ 4035		3	CAJ 4034, CAJ 4035		3	CAJ 6006, CAJ 6017		3	CAJ 6006, CAJ 6017
SINGLE INSULATED PIPES	1	FA 5015, FA 5016, CAJ 5090, CAJ 5091, CAJ 5098	SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, CAJ 5061	SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, CAJ 5061	ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017
	2	FA 5015, FA 5016, CAJ 5090, CAJ 5091, CAJ 5098		2	CAJ 5090, CAJ 5091, CAJ 5061		2	CAJ 5090, CAJ 5061		2	CAJ 6006, CAJ 6017
	3	FA 5016, CAJ 5090		3	CAJ 5090, CAJ 5061		3	CAJ 5090, CAJ 5061		3	CAJ 6006, CAJ 6017
	4	CBJ 5006		4	CBJ 5006, WJ 5028		4	CBJ 5006, WJ 5028		4	CAJ 6006, CAJ 6017
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022
	2	CAJ 6006, CAJ 6017		2	CAJ 6006, CAJ 6017		2	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022		2	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022
	3	CAJ 6006, CAJ 6017		3	CAJ 6006, CAJ 6017		3	CAJ 7046, CAJ 7051		3	CAJ 7046, CAJ 7051
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, CAJ 7051	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022	MIXED PENETRANTS	1	CAJ 8041, CAJ 8056, WJ 8007
	2	CAJ 7046, CAJ 7051		2	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022		2	CAJ 7046, CAJ 7051, WJ 7021, WJ 7022		2	CAJ 8041, CAJ 8056, WJ 8007
	3	CAJ 7046, CAJ 7051		3	CAJ 7046, CAJ 7051		3	CAJ 7046, CAJ 7051		3	CAJ 8041, CAJ 8056, WJ 8007
MIXED PENETRANTS	1	CAJ 8041, CAJ 8056	MIXED PENETRANTS	1	CAJ 8041, CAJ 8056, WJ 8007	MIXED PENETRANTS	1	CAJ 8041, CAJ 8056, WJ 8007	MIXED PENETRANTS	1	CAJ 8041, CAJ 8056, WJ 8007
	2	CAJ 8041, CAJ 8056		2	CAJ 8041, CAJ 8056, WJ 8007		2	CAJ 8041, CAJ 8056, WJ 8007		2	CAJ 8041, CAJ 8056, WJ 8007
	3	CAJ 8041, CAJ 8056		3	CAJ 8041, CAJ 8056, WJ 8007		3	CAJ 8041, CAJ 8056, WJ 8007		3	CAJ 8041, CAJ 8056, WJ 8007

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4	CBJ 8010	4	CBJ 8010, WJ 8007
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<b>WOOD</b>			<b>FLOOR</b>			<b>GYPSUM WALLBOARD</b>			<b>ASSEMBLY</b>		
<b>TYPE OF PENETRANT</b>	<b>F-RATING (HRS)</b>	<b>UL-CLASSIFIED SYSTEM</b>	<b>TYPE OF PENETRANT</b>	<b>F-RATING (HRS)</b>	<b>UL-CLASSIFIED SYSTEM</b>	<b>TYPE OF PENETRANT</b>	<b>F-RATING (HRS)</b>	<b>UL-CLASSIFIED SYSTEM</b>	<b>TYPE OF PENETRANT</b>	<b>F-RATING (HRS)</b>	<b>UL-CLASSIFIED SYSTEM</b>
METAL PIPES OR CONDUIT	1	FC 1009, FC 1059	METAL PIPES OR CONDUIT	1	WL 1054, WL 1058, WL 1164	METAL PIPES OR CONDUIT	1	WL 1054, WL 1058, WL 1164	METAL PIPES OR CONDUIT	1	WL 1054, WL 1058, WL 1164
	2	FC 1009, FC 1059		2	WL 1054, WL 1058, WL 1164		2	WL 1054, WL 1058, WL 1164			
				4	WL 1110, WL 1111		4	WL 1110, WL 1111			
NON-METALLIC PIPE OR CONDUIT	1	FC 2025, FC 2030, FC 2160	NON-METALLIC PIPE OR CONDUIT	1	WL 2078, WL 2075, WL 2128	NON-METALLIC PIPE OR CONDUIT	1	WL 2078, WL 2075, WL 2128	NON-METALLIC PIPE OR CONDUIT	1	WL 2078, WL 2075, WL 2128
	2	FC 2025, FC 2029, FC 2128		2	WL 2078, WL 2075, WL 2128		2	WL 2078, WL 2075, WL 2128			
				4	WL 2184		4	WL 2184			
SINGLE OR BUNDLED CABLES	1	FC 3012, FC 3044	SINGLE OR BUNDLED CABLES	1	WL 3065, WL 3111, WL 3112	SINGLE OR BUNDLED CABLES	1	WL 3065, WL 3111, WL 3112	SINGLE OR BUNDLED CABLES	1	WL 3065, WL 3111, WL 3112
	2	FC 3012		2	WL 3065, WL 3111, WL 3112		2	WL 3065, WL 3111, WL 3112			
				4	WL 3139		4	WL 3139			
INSULATED PIPES	1	FC 5004, FC 3036, FC 3037	CABLE TRAY	1	WL 4011, WL 4019	CABLE TRAY	1	WL 4011, WL 4019	CABLE TRAY	1	WL 4011, WL 4019
	2	FC 5004, FC 3036, FC 3037		2	WL 4011, WL 4019		2	WL 4011, WL 4019			
				4	WL 8014		4	WL 8014			
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	FC 7013	INSULATED PIPES	1	WL 5028, WL 5029, WL 5047	INSULATED PIPES	1	WL 5028, WL 5029, WL 5047	INSULATED PIPES	1	WL 5028, WL 5029, WL 5047
	2			2	WL 5028, WL 5029, WL 5047		2	WL 5028, WL 5029, WL 5047			
				4	WL 5073		4	WL 5073			
MIXED PENETRANTS	1	FC 8009, FC 8014	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	WL 7017, WL 7040, WL 7042	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	WL 7017, WL 7040, WL 7042	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	WL 7017, WL 7040, WL 7042
	2			2	WL 7040, WL 7042		2	WL 7040, WL 7042			
				4			4				
MIXED PENETRANTS	1	FC 8009, FC 8014	MIXED PENETRANTS	1	WL 1095, WL 8013	MIXED PENETRANTS	1	WL 1095, WL 8013	MIXED PENETRANTS	1	WL 1095, WL 8013
	2			2	WL 1095, WL 8013		2	WL 1095, WL 8013			
				4	WL 8014		4	WL 8014			

NOTES:

1. Jobsite conditions of each through-penetration firestop system must meet ALL details of the UL-Classified System selected.
2. If jobsite conditions do not match any UL-classified systems in the schedules above, contact Hilti for alternative systems or Engineer Judgement Drawings – 800-879-8000
3. Where more than one applicable UL-Classified System is listed in the schedules, choose the UL System that is most economical for each through-penetration firestop system.
4. Coordinate work with other trades to assure that penetration opening sizes are appropriate for penetrant locations, and vice versa.

END OF SECTION

## SECTION 07920 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes sealants for the following applications, including those specified by reference to this Section:

- 1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
  - a. Control and expansion joints in unit masonry.
  - b. Perimeter joints between materials listed above and frames of doors and windows.
  - c. Other joints as indicated or required.
- 2. Exterior joints in the following horizontal traffic surfaces:
  - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
  - b. Other joints as indicated or required.
- 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
  - a. Control and expansion joints on exposed interior surfaces of exterior walls.
  - b. Perimeter joints of exterior openings where indicated.
  - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
  - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - e. Other joints as indicated or required.

#### 1.3 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete.
- B. Section 04810 - Unit Masonry Assemblies.

#### 1.4 REFERENCES

- A. ASTM C 834 - Standard Specification for Latex Sealants.
- B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.

- C. ASTM C 1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- D. FS (Federal Specification) TT-S-00227E (COM-NBS) - Interim Federal Specification for Sealing Compound: Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
- E. FS (Federal Specification) TT-S-00230C - Interim Federal Specification for Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
- F. FS (Federal Specification) TT-S-001543 (COM-NBS) - Interim Federal Specification for Sealing Compound: Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures).

#### 1.5 SUBMITTALS

- A. Manufacturer's Technical Data Guides and application procedures.
- B. Submit samples illustrating colors selected.
- C. Submit laboratory tests or data validating product compliance with performance criteria specified.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company regularly engaged in manufacturing and marketing of products specified in this section.
- B. Installer Qualifications: Qualified to perform work specified by reason of experience or training provided by product manufacturer.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.
- B. Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight in strict accordance with manufacturer's recommendations.
- C. Condition products to approximately 60 to 70 degrees F (16 to 21 degrees C) for use in accordance with manufacturer's recommendations.
- D. Handle all products with appropriate precautions and care as stated on Material Safety Data Sheet.

## 1.8 PROJECT CONDITIONS

- A. Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.
- B. Ensure substrate is dry.
- C. Protect adjacent work from contamination due to mixing, handling, and application of flexible epoxy joint filler.

## 1.9 WARRANTY

- A. Provide manufacturer's warranty (Warranty should be discussed prior to project start-up to determine length of warranty and terms.)
- B. Include coverage for replacement of sealant materials which fail to achieve water tight seal, exhibit loss of adhesion or cohesion, or do not cure.
- C. Warranty Exclusions: Failure resulting from concrete shrinkage, structural cracks or defects, faulty construction, faulty design, faulty materials (other than joint filler), misuse of structure, settlement, or accident, fire or other casualty or physical damage.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers (Sealants and Joint Fillers):
  - 1. Sonneborn(R) Building Products, ChemRex, Inc., 889 Valley Park Drive, Shakopee, MN 55379-9897; ASD. Tel: (800) CHEMREX (243-6739). Manufacturers representatives, Scott Meyer (617)721-8429, Graham Gurry (800) 243-6739.
  - 2. Tremco
  - 3. Dow Corning.
- B. Provide all joint sealers of the same type from a single manufacturer.

### 2.1 MATERIALS

- A. Single Component, Non-Sag Polyurethane Sealant: Sonneborn(R)/ChemRex "Sonolastic(R) NP 1(tm)" with plus or minus 25 percent movement capability for vertical joints; ASTM C 920, Type S, Grade NS, Class 25; FS TT-S-00230C, Type II, Class A; Canadian Specification CAN/CGSB-19.13-M87, Classification MCG-2-25-A-N, No. 81026; USDA approved; SWRI validated; UL classified (fire resistance) or approved equal.

- B. Single Component, Polyurethane Sealant: Plus or minus 25 percent joint movement capability; ASTM C 920, Type S, Grade NS, Class 25, uses NT, M, A, and O; FS TT-S-00230C.
- C. Single Component, Self-Leveling Polyurethane Sealant: Sonneborn(R)/ChemRex "Sonolastic(R) SL 1(tm)" with plus or minus 25 percent movement capability for horizontal joints; ASTM C 920, Type S, Grade P, Class 25; FS TT-S-00230C, Type I, Class A; Canadian Specification CAN/CGSB-19.13-M87, Classifications C-1-40-B-N and C-1-25-B-N, No. 81028; USDA approved or approved equal.
- D. Two Component, Self-Leveling Polyurethane Sealant: Sonneborn(R)/ChemRex "Sonolastic(R) SL 2(tm)" with plus or minus 25 percent movement capability for horizontal joints; ASTM C 920, Type M, Grade P, Class 25; FS TT-S-00227E, Type I, Class A; Canadian Specification CAN/CGSB-19.24-M90, Classification MCG-1-40-B-L, No. 81031; USDA approved, or approved equal.
- E. Self-Leveling Polyurethane Sealant: Plus or minus 25 percent joint movement capability for horizontal joints; ASTM C 920, Type M, Grade P, Class 25, uses T, M, and O; FS TT-S-00227E; USDA approved.
- F. Polysulfide Sealant: Sonneborn two part polysulfide, ASTM C 920, Type M, Grade NS and FS TT-S-00227 (COM-NBS); plus or minus 25 percent joint movement capability, USDA approved.
- G. Poured Flexible Epoxy Joint Filler: Sonneborn(R)/ChemRex "Epolith(R)-P"; two component 100 percent solids epoxy joint filler with flexible, pourable, self-leveling properties.
  - 4. Shore A Hardness: 85 plus or minus 5.
  - 5. Shore D Hardness: 34.
  - 6. Elongation: 75 percent.
  - 7. Tensile Strength: 655 pounds per square inch (4.5 MPa) plus or minus 10 pounds per square inch (0.07 MPa).
  - 8. Mixing Ratio: 1 to 1 by volume.
  - 9. Pot Life: 40 to 55 minutes at 75 degrees F (24 degrees C).
  - 10. Cure Time, Foot Traffic: 4 hours.
  - 11. Cure Time, Vehicular Traffic: 24 hours.
  - 12. Application Temperature: Minimum 55 degrees F (13 degrees C).
- J. Gunned Flexible Epoxy Joint Filler: Sonneborn(R)/ChemRex "Epolith(R)-G"; two component 100 percent solids, gun-grade epoxy joint filler with flexible, pick-proof properties for sloped areas.
  - 1. Shore A Hardness: 90 plus or minus 5.
  - 2. Shore D Hardness: 50.
  - 3. Elongation: 50 percent.

4. Tensile Strength: 900 pounds per square inch (6.2 MPa) plus or minus 10 pounds per square inch (0.07 MPa).
  5. Slant Shear Strength: 865 pounds per square inch (6.0 MPa) per ASTM C 882.
  6. Slant Shear Strength: 112 pounds per square inch (0.8 MPa) per ASTM C 321.
  7. Mixing Ratio: 1 to 1 by volume.
  8. Pot Life: 40 to 55 minutes at 75 degrees F (24 degrees C).
  9. Cure Time, Foot Traffic: 4 hours.
  10. Cure Time, Vehicular Traffic: 24 hours.
  11. Application Temperature: Minimum 55 degrees F (13 degrees C).
- K. Polyurea: Two component self levelling fast setting, 100% solids control joint filler, Sonneborn TF100 or approved equal.
- L. Silyl Terminated Polyeter Sealant: ASTM C920, Type S, Grade NS, Class 25, use NT, M, A, G, and O, Sonneborn Sonolastic 150; one component, 150%(+100/-50) movement capability.
- M. Silicone: ASTM C920, Type S, Grade NS, Class 25, use NT, M, A, G, O, and T. Dow Corning 790 Sealant, 150%(+100/-50) movement capability.
- N. Textured Polyurethane Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT, M, A, G, and O, Sonneborn TX-1, one component sand textured sealant or approved equal by Tremco.

## 2.2 ACCESSORIES

- A. Primer: Sonneborn(R)/ChemRex "Primer No. 733," solvent based, or approved equal.
- B. Low VOC Primer: Sonneborn(R)/ChemRex "Primer No. 766," solvent based, or approved equal.
- C. Joint Cleaner: Sonneborn(R)/ChemRex "REDUCER 990"; non-corrosive and non-staining, or approved equal.
- D. Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.
- E. Soft Backer Rod: Sonneborn(R)/ChemRex "Sonofoam Soft Backer Rod"; non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants.
1. Comply with ASTM C 1330.
  2. Size required for joint design.
- F. Closed-Cell Backer Rod: Sonneborn(R)/ChemRex "Sonofoam Closed-Cell Backer Rod"; closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications.

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1. Comply with ASTM C 1330.
  2. Size required for joint design.
- G. Joint Filler: Sonneborn(R)/ChemRex "Expansion Joint Filler"; closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 1/4 inch (6 mm).
1. Size required for joint design.
- H. Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

### 2.3 COLOR

- A. Sealant Colors: Selected by Contracting Officer.
1. Manufacturer's standard color range.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Inspect all areas involved in work to establish extent of work, access, and need for protection of surrounding construction.
- B. Protect all surroundings from flexible epoxy joint filler including, but not limited to, floors, equipment, line striping, walkways, and drives.
- C. Conduct preapplication inspection of site verification with an authorized manufacturer's representative.

### 3.2 PREPARATION

- A. Remove loose materials and foreign matter which impair adhesion of joint filler.
- B. Clean joints and saw cuts by grinding, sandblasting, or wire brushing to expose a sound surface free of contamination and laitance.
- C. Ensure structurally sound surfaces, dry, clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing and parting compounds, membrane materials, and other foreign matter.
- D. Where the possibility of joint filler staining of adjacent areas or materials exists, mask joints prior to application.
1. Do not remove masking tape before joints have been tooled and initial cure of joint filler has taken place.
  2. Work stained due to failure of proper masking precautions will not be accepted.

### 3.3 INSTALLATION

#### A. Back-Up Material:

1. Install appropriate size backer rod, larger than joint where necessary according to manufacturer's recommendations.
2. Install polyethylene joint filler in joints wider than 1/4 inch (6 mm) to back-up material per manufacturer's recommendations.
3. Do not install epoxy joint filler over backer rod.

#### B. Bond Breaker: Install bond-breaker strip in joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material; install per manufacturer's recommendations.

#### C. Sealant:

1. Prepare sealants that require mixing; follow manufacturer's recommended procedures, mixing thoroughly.
2. Mix only as much material as can be applied within manufacturer's recommended application time period.
3. Apply materials in accordance with manufacturer's recommendations; take care to produce beads of proper width and depth, tool as recommended by manufacturer, and immediately remove surplus sealant.
4. Apply materials only within manufacturer's specified application life period. Discard sealant after application life is expired or if prescribed application period has elapsed.

### 3.4 CLEANING

#### A. Remove uncured sealant and joint filler with Reducer 990, xylene, toluene, or MEK. Remove cured sealant and joint filler by razor, scraping, or mechanically.

#### B. Remove all debris related to application of sealants from job site in accordance with all applicable regulations for hazardous waste disposal.

### 3.5 SCHEDULE OF JOINT SEALERS

#### A. General-Purpose Interior and Exterior Applications:

1. Sealant:
  - a. Single component polyurethane.
  - b. Two component polyurethane.
  - c. Silyl Terminated Polyether
  - d. Silicone.

2. Applications:
  - a. Joints and recesses between adjacent constructions and frames, sills, and subsills of windows, doors, curtainwall, storefront, and louvers.
  - b. Coping joints and wash joints in precast concrete, cast stone, or natural stone.
  - c. Masonry joints beneath shelf angles.
  - d. Around penetrations in exterior walls.
  - e. Under door thresholds and at bottom of door frames.
  - f. Where necessary to prevent infiltration of water or air into or through exterior building envelope.
  - g. Joints between new and existing exterior construction.
- B. Other Exterior Applications:
  1. Sealant:
    - a. Single component polyurethane.
    - b. Two component polyurethane.
    - c. Silyl Terminated Polyether
    - d. Silicone.
  2. Applications:
    - a. Between adjacent construction and gravel stops, copings, fascias, and miscellaneous flashings.
    - b. Metal flashings inserted into reglet.
    - c. Top edges of surface mounted counterflashing.
    - d. Expansion and control joints in masonry where expansion joint covers are not indicated.
    - e. Joints between new and existing exterior construction.
- C. Other Interior Applications:
  1. Sealant:
    - a. Single component polyurethane.
    - b. Silyl Terminated Polyether
  2. Applications:
    - a. Perimeters of door and window frames, access panels.
    - b. Between interior partitions and adjoining concrete or steel columns, walls, or other construction.
    - c. Other exposed locations within partitions to seal against passage of air.
    - d. Other interior joints of small dimension which require painting.
  3. Allow sealant to cure before painting over joint.
- D. Interior Traffic Surfaces:
  1. Sealant:
    - a. Two component self-leveling polyurethane.
    - b. Single component self-leveling polyurethane.

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2. Applications:
  - a. Control and expansion joints in floors.

END OF SECTION

## SECTION 08110 - STEEL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Steel doors.
  - 2. Steel doorframes.
- B. Related Sections include the following:
  - 1. Division 8 Section "Door Hardware (Scheduled by Naming Products)" for door hardware and weather stripping.
  - 2. Division 9 Section "Painting" for field painting factory-primed doors and frames.

#### 1.3 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. Shop Drawings: Show the following:
  - 1. Elevations of each door design.
  - 2. Details of doors including vertical and horizontal edge details.
  - 3. Frame details for each frame type including dimensioned profiles.
  - 4. Details and locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, accessories, joints, and connections.
  - 7. Coordination of glazing frames and stops with glass and glazing requirements.
- C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

## 1.5 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Contracting Officer. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel Doors and Frames:
    - a. Amweld Building Products, Inc.
    - b. Benchmark Commercial Doors; a division of General Products Co., Inc.
    - c. Ceco Door Products; a United Dominion Company.
    - d. Copco Door Co.
    - e. Curries Company.
    - f. Deansteel Manufacturing, Inc.
    - g. Kewanee Corporation (The).
    - h. Mesker Door, Inc.
    - i. Pioneer Industries Inc.
    - j. Republic Builders Products.
    - k. Steelcraft; a division of Ingersoll-Rand.

### 2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

## 2.3 DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated.
- B. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
  - 1. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).

## 2.4 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frames of 0.067-inch- (1.7-mm-) thick steel sheet for:
  - 1. Level 4 steel doors, unless otherwise indicated.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

## 2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush

as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

- C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.
  - 1. Polystyrene.
- D. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads. Not more than 3/4 inch (19 mm) at bottom.
- E. Single-Acting, Door-Edge Profile: Beveled edge.
- F. Double-Acting, Door-Edge Profile: Round vertical edges with 2-1/8-inch (54-mm) radius.
- G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- H. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- I. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- J. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
  - 1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.067 or better.
- K. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
  - 1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.
- L. Frame Construction: Fabricate frames to shape shown.
  - 1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
  - 2. Fabricate knock-down frames with mitered or coped corners, for field assembly at existing openings.
  - 3. For exterior applications, fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
  - 4. Provide welded frames with temporary spreader bars.

- M. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
  - N. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- 2.6 FINISHES
- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.
    - 1. Color and Gloss: As selected by Contracting Officer from manufacturer's full range.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
  - 1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
  - 2. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
  - 3. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
  - 4. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

#### 3.2 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

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- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

## SECTION 08342 - HANGAR DOOR REFURBISHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the repair and refurbishing of the existing hangar doors and operating systems to complete functionality and operating capacity.
- B. Related Sections include the following:
  - 1. Division 8 Section "Translucent Wall Assemblies" for glazing in hangar doors.
  - 2. Division 9 Section "Painting" for repainting hangar doors.
  - 3. Division 16 Sections for electrical power.

#### 1.3 SCOPE OF WORK

- A. The existing door system consists of a 6-leaf Bi-parting Anchored Group filling an opening approximately 160'-0" wide by 31'-0" high. Each slide door leaf is comprised of six welded up panel sections. They are fabricated from standard 7" ship channel (that was prevalent during the 1950's; when the doors were initially built). The exterior covering is either 13 or 14 gauge flat sheet steel.
- B. The existing doors shall be repaired, replaced, and refurbished as follows:
  - 1. Align and weld top guides.
  - 2. Replace top guide rollers.
  - 3. Replace bottom wheels.
  - 4. Replace motor operator systems.
  - 5. Replace trolley duct systems, one for each run of top guides/bottom rails.
  - 6. Replace weatherstripping.
  - 7. Replace electrical controls, one for each group of doors.
  - 8. Replace translucent panels.
  - 9. Scrape, prime, and prepare doors as required for repainting, and repaint door panels.
  - 10. Adjust cables.
  - 11. Replace personnel swing doors (4) and one frame as indicated on drawings.

#### 1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for hangar doors.

1. Electrical Data: Include rated capacities; voltage, phase, and amperage requirements; controls; specialties; and accessories.
  - B. Shop Drawings: All design and shop drawings and complete calculations for all structural, mechanical, electrical and operational features of the doors, operations and brakes shall be provided. The drawings shall name and list in detail each and every component used in and on the doors, including the manufacturer's name, catalog number and full description of the component.
    1. Wiring Diagrams: Power, signal, and control wiring. Field wiring diagrams, schematic wiring diagrams and physical location of electrical controls drawings.
    2. Details of other trades affecting the doors shall be submitted to the hangar door repair contractor for review, coordination, and approval.
  - C. Operation and Maintenance Manuals: Two complete manuals containing instructions for proper operation and maintenance of the doors shall be furnished by the door repair contractor to the Contracting Officer. They shall contain complete:
    1. Operating instructions.
    2. Maintenance instructions.
    3. A chart showing all points to be lubricated, type of lubricant, and frequency of lubrication.
    4. A chart giving a check list of parts to be serviced and adjusted and the frequency of adjustment.
    5. A complete list of spare parts.
    6. A manufacturer's catalog for each and every component used in or on the doors.
  - D. Warranties:
- 1.5 QUALITY ASSURANCE

- A. Doors and operating mechanisms shall be repaired and refurbished by a Door Manufacturer who has been continuously engaged in the design, manufacture, installation, and repair of aircraft hangar doors for over thirty-five (35) years.
  1. In order to meet the qualifications for this project, the manufacturer must support, with written evidence, that they have designed, manufactured, and installed a minimum of twenty five (25) MOTOR OPERATED BIPARTING ANCHORED GROUP HANGAR DOORS similar to the existing doors, that have been in satisfactory operation for a minimum of three years, with a minimum of fifteen (15) installations that are equal to or in excess of 30'-0" high.
  2. Written evidence will include at least twenty five hangar door installations made by their Company. Such list shall include name of installation, location, Owner, Architect, date installed and specific data as to size of doors, type of doors, type of operators, type of brake systems, type of safety devices, type of operating systems, type of top guides and top guide rollers, weather stripping, and etc.

3. Written evidence shall list only door installations that have been designed, manufactured and installed by the submitting Door Manufacturer. Installations that were designed, manufactured and installed by another entity that the submitting Door Manufacturer purchased or integrated in whole or in part are not acceptable.
4. The Fleming Steel Company, New Castle, Pennsylvania, is pre-qualified and is named as the standard of quality desired and acceptable.
5. Other manufacturers requesting approval as an equal to the companies named, must submit the information as detailed out in this section.
6. Requests for approval shall be made at least four weeks prior to bid date to permit checking of references and qualifications by the Contracting Officer.
7. The hangar door contract will not be approved by the Contracting Officer except to Door Manufacturers who have so qualified and been approved in writing as having the required experience in the type and size of doors required for this project.
8. Such written approval, with the manufacturers' names and addresses, will be issued by Addenda to all plan holders prior to bid. The General Contractors shall be responsible for using bids from qualified and approved hangar door manufactures only.
9. Any cost difference between a qualified manufacturer and an unqualified manufacturer (used by the successful General Contractor) shall be borne by the Contractor solely.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable manufacturers are listed in the Quality Assurance section above.

### 2.2 MATERIALS

- A. As described in Section 3, Execution, below.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Thoroughly examine and inspect existing doors, tracks, guides, structure, and all other features, elements, and conditions to determine the scope of work and confirm that the work described herein will result in fully repaired and operational doors. Should the inspection reveal that additional or alternative measures are required, immediately notify Contracting Officer.

### 3.2 INSTALLATION

- A. Align top guides: There are offsetting joints in the guides. These joints need to be aligned and welded in order to eliminate this condition.
- B. Replace top guide rollers: The existing top guide rollers are a quasi - telescopic top guide roller assembly. Each roller head has four vertical rollers. The top guide roller assemblies should

also have horizontal rollers to efficiently transmit the wind loading from the door into the guides. Replace the rollers as follows:

1. Telescoping type top guide roller assemblies shall be designed to move up and down to accommodate a maximum of 3" negative deflection and 2" uplift of the roof under live load. Each door leaf section shall be provided with two such assemblies. Each assembly shall have four horizontally mounted chamfered steel rollers with permanently lubricated bushings and bronze thrust washers. The rollers shall be mounted on hardened and turned steel pins sized to resist the loads imposed on them.
  2. Each assembly shall also have four vertically mounted steel rollers equipped with permanently lubricated bushings. The assembly of horizontal and vertical rollers shall be mounted in a rigid welded steel housing which shall be connected to a steel telescoping post of adequate size and design to transmit the specified wind loads from the door leaves to the top guides. The post shall be designed to resist all bending loads and stresses with an adequate safety factor of 2.
- C. Replace bottom wheels: The bottom wheels in the existing doors are 18" diameter open spoke cast steel "Allith Prouty" wheels. Replace them as follows:
1. Bottom rollers shall be made of plate steel having a minimum tread diameter of 18 inches. They shall be high strength steel meeting or exceeding the minimum requirements as given in ASTM Designation A-36 for welded wheels. Rollers shall be designed to permit removal without taking the door leaves from their position on the rails.
  2. Treads shall be machined concentric with bearing seats. The horizontal clearance between wheel and rail shall not be more than 1/8" at the bottom, nor more than 1/4" at the edge of the flange.
  3. Two internally mounted tapered roller bearings shall be provided for each wheel and arranged so that both the vertical loads from the leaves and the horizontal wind loads can only be transmitted from the leaf to the wheel through the bearings. Bearings shall be provided with seals high pressure grease fittings for lubrication.
- D. Replace motor operator system: Each 3-leaf door group is driven by a center leaf mounted motor operator system that uses a manual clutching mechanism and drives two wheels. Replace the clutch mechanisms and operator controls as follows:
1. OPERATING SYSTEM: Operation of each 3-leaf group shall be by traction type power drives with one in the drive leaf. The power drives shall be designed to move the leaves in either direction, at a maximum speed of 45 feet per minute at zero wind load conditions and shall be operable up to and including a wind load of 5 pounds per square foot.
  2. The power drive units shall consist of a gearhead motor with high speed shaft brake coupled to separate gear reducer. The necessary roller chains, sprockets, take-up devices necessary to drive the leaves shall be provided.
  3. Each system shall be provided with an acceptable means of emergency conversion to tractor towing.
  4. The drive motors shall be squirrel cage induction type, sized to operate the leaves under zero wind load conditions at not more than 75% of their rated capacity; motors shall be

- rated for door operation duty and shall be normal starting torque type. They shall be wound for service at 460/230 volts, 3 phase, 60 hertz.
5. The gear reduction units shall be of the highest quality helical worm gear double reduction of commercial manufacture and shall have internal continuous lubrication. The units shall be of a type which allow a reversal of effort through the gears without damage to the gears. The gears shall be non self-locking and be rated AGMA standard with a safety factor of 1.
  6. The high speed shaft brakes shall be integral with the motors and shall be of the spring set solenoid release self-adjusting disc type with an auxiliary manual release.
- E. Replace trolley duct buss bar system: The existing trolley duct buss bar system is a metal housing unit similar to Midland Ross Feedrail. Dead spots are common due to separation of the housings at the joints. Replace the trolley duct system in accordance with the following specifications:
1. TROLLEY DUCTS: One full length run of trolley duct shall be provided for each run of top guides/ bottom rails. Ducts shall be U-S Safety Trolley or equal with 4 solid copper conductors in a protective PVC housing. They shall be located as shown on the drawings. They shall be rated for 100 amperes continuous duty.
  2. Each run shall consist of the required number of sections of straight track, feed boxes, end caps, couplings, hangers and other accessories to make the system complete and workable.
  3. One top roller supported trolley and trolley pull bracket shall be supplied for each powered leaf complete with brush contacts.
- F. Remove existing weatherstripping and replace as follows:
1. WEATHERING: Material which is adjustable and readily replaceable shall be provided at all necessary vertical edges, head and sill to afford a substantially weathertight installation.
  2. Material on jambs and sill shall be flap wipe type 2-ply cloth-inserted 100% EPDM 1/8 inch thick. The weathering shall be retained continuously by 12" x 3/16" steel keeper bars for its full length and secured with 1/4" rust resistant fasteners on 12" centers.
  3. Vertical weatherstripping at the jambs and the interface between the door leaves shall close against metal flashings that are cold-formed to the configuration and located on the door leaves and jambs as shown on the drawings. They shall be attached to the door leaves and jambs on 12" centers with standard rust resistant siding fasteners.
  4. Where the two center hangar door leaves (in the full close position) butt against each other, the abutting edges shall have a single run of compression bulb weathering. Bulb weathering shall be full height of the door and shall be composed of 1/8" thick 2-ply cloth-inserted EPDM mounted on a 3" hot rolled structural steel channel. The neoprene bulb shall be retained with a continuous retainer bar 12" x 3/16" and 1/4" rust resistant fasteners at not over 12" centers.
- G. Remove and entirely replace electrical controls in accordance with the following:
1. ELECTRICAL CONTROLS: The door manufacturer shall furnish each group of the doors with the proper electrical equipment and controls, built in accordance with the

latest NEMA Standards. All equipment, power and control circuits shall be installed in accordance with the National Electrical Code, Standard No. 70, article 513. Any equipment located 18 inches or less above the floor shall be explosion proof. Control circuits shall not exceed nominal 110 volts.

2. Magnetic reversing starters with electronic "Soft Start" controllers shall be enclosed in a NEMA 12 enclosures with a three pole fused lockable disconnect switch and shall be factory wired and equipped with overload and undervoltage protection, mechanical and electrical interlocks, relays, timing devices and transformers for the control circuits. A wiring diagram shall be placed on the inside of each enclosure cover.
3. Push Buttons: Provide one 2-button push button station, marked "OPEN" and "CLOSE", near the inside leading edge of each "power" leaf. Each element shall have a constant pressure head so removing pressure from the button shall stop the movement of the doors. The push buttons shall be in NEMA 12 enclosures. The drive leaf pickup bracket shall be configured in order to provide sufficient clearance to prevent the button station from traveling into a shearing or crushing danger area.
4. Limit switches shall be provided to stop the travel of the doors in their fully opened or fully closed position. The limit switches shall be positive acting snap-action type with actuating cams designed with sufficient overtravel to permit the group to come to a complete stop without over traveling the limit switches. The limit switches shall be mounted on the power leaf with actuating cams mounted on the top guides overhead.
5. Personnel door interlock shall be provided.
6. A clearly audible signal shall be provided on the drive leaf of each group and shall operate when the push buttons are actuated for movement of the doors in either direction. The signal device shall be not less than a 6 inch diameter bell or equivalent decibel rated horn loud enough to be clearly heard in the hangar and on the apron. The signal shall sound continuously when the group is in motion.
7. Each control enclosure shall be completely shop wired and be provided with a numbered terminal strip for the convenience of the Electrical Contractor.
8. ELECTRICAL WIRING AND SOURCE OF POWER: All conduit and fittings, flexible multi-conductor cables, junction boxes, and all labor to wire and connect to and between all electrical equipment on the doors shall be installed in accordance with the door manufacturer's approved wiring diagrams and drawings by the Electrical Subcontractor.
9. The door manufacturer's wiring diagrams shall include a complete schematic wiring diagram; a field wiring diagram; a complete physical location drawing showing all of the controls with the runs of conduit, size of conduit, number and size of wires, location of junction boxes and full details of control mountings.

### 3.3 ADJUSTING AND CLEANING

- A. Operate hangar doors on completion of repairs and refurbishing to ensure satisfactory operation. Check moving parts for proper alignment and lubrication. Make adjustments for smooth, easy operation. Adjust cables as necessary.
- B. Clean surfaces and reprime abraded or damaged surfaces to match factory-applied finish.

END OF SECTION 08342

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## SECTION 08710 - FINISH HARDWARE

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Work of this Section includes all labor, materials, equipment and services necessary to furnish all the finish hardware as shown on the drawings and specified herein.
- B. The required hardware items for doors are indicated in hardware sets shown herein. Should any opening be omitted, the contractor shall contact the Architect for the correct hardware.

#### 1.3 RELATED WORK

- A. Steel doors and frames - Section 08110.
- B. Painting - Section 09900.

#### 1.4 SUBMITTALS:

- A. General: Submit the following in accordance with the provisions of the general contract documents.
- B. Hardware Schedule: Submit three (3) copies of the hardware schedule. Follow Door and Hardware Institute (DHI) guide lines for scheduling. At the beginning of the schedule furnish an index which list's each door number with appropriate heading number and hardware set number. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work. Furnish final schedule after samples, manufacturer's data sheets have been approved. **HORIZONTAL SCHEDULES WILL NOT BE ACCEPTED.**
- C. Product Data: Submit three (3) copies of the manufacturer's data for each item of hardware. Include whatever information may be necessary to show compliance with requirements.
- D. Keying Schedule: A key schedule showing all key numbers and spaces to which each permits entry, shall be provided. Consult with OWNER before submitting final key schedule. After final approval has been received, the schedule along with the key gathering envelopes containing keys for each lock endorsed with lock number and space designation, shall be turned over to the OWNER.
- E. Samples: Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one (1) sample of each exposed hardware unit. Sample will be reviewed by the ARCHITECT for design, color and texture only. Compliance with other requirements is the

exclusive responsibility of the CONTRACTOR. Samples approved by the ARCHITECT shall be turned over to the OWNER.

#### 1.5 QUALITY ASSURANCE

- A. Standards: All finish hardware shall conform to all of the following standards:
1. Testing Laboratories: Underwriters Laboratory (UL) and or Warnock Hersey Fire Laboratories Division: All fire rated doors shall have hardware assemblies approved by one of the listed laboratories. Panic hardware UL Listed only.
  2. National Fire Protection Association: NFPA 80 and NFPA 101.
  3. Builders Hardware Manufacturers Association (BHMA).
  4. American National Standards Institute (ANSI).
  5. American Disabilities Act (ADA).
- B. Supplier: Finish hardware shall be furnished by those having a minimum of 5 years of builders hardware experience and shall have in their employ at least one certified Architectural Hardware Consultants (AHC) to correctly interpret the plans, detailed drawings and specifications.

#### 1.6 PRODUCT HANDLING

- A. Handle, store, distribute, protect and install in accordance with the manufacturers instructions. Deliver packaged material in original containers with seals unbroken and labels intact. Deliver assemblies completely identified and with adequate protection for storage, handling and installation.
- B. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses; both before and after installation.

#### 1.7 PROJECT CONDITIONS

- A. Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated and as necessary for proper installation and function. Deliver packaged hardware items to the proper locations for installation.
- B. Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware.

#### 1.8 WARRANTIES

- A. The hardware manufacturers shall provide full replacement warranty as listed below.

- |    |                     |           |
|----|---------------------|-----------|
| 1. | Surface Closers     | 10 years. |
| 2. | Locksets etc.       | 3 years   |
| 3. | Exit Devices        | 3 years   |
| 4. | Balance of hardware | 1 year    |

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND FABRICATION

- A. Hand of Door: The drawings show the swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door swing shown.
- B. Base Metals: Produce hardware units of the basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness but in no case of lesser quality material.
- C. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws.
- D. Screws: Furnish screws for installation, with each hardware item. Finish exposed screws to match the hardware finish.
- E. Tools for Maintenance: Furnish a complete set of specialized tools as needed, for the OWNERS continued maintenance, removal and replacement of hardware.
- F. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard manufacturer's units are available with concealed fasteners. Use thru bolts only where necessary to adequately fasten hardware to the door.

### 2.2 HINGES

- A. All hinges shall be full mortise five knuckle ball bearing type, template, with non-rising loose pins. Exterior doors and all outswing doors shall have non-removable pins (NRP).
- B. All hinges for 1-3/4" thick doors shall be 4-1/2" wide in the open position. For other thickness doors hinges shall be of a width to permit unobstructed swing of the doors.
- C. Size and weight of hinges shall conform to the following:
  - Doors up to 36" -----4-1/2" Standard Weight
  - Doors from 36" to 42" -----5" Heavy Weight
  - Doors over 42" -----Zero 919STST – Continuous Hinge
- D. Quantity of hinges shall be provided to conform to the following:
  - Doors up to 60" in height -----2 hinges

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Doors 60" to 90" in height -----3 hinges  
Doors 90" and over -----1 hinge every 30" in height

- E. All hinges shall be the products of one manufacturer.

## 2.3 DOOR CLOSING DEVICES

- A. All surface door closers shall meet ANSI A156.4 Grade 1 requirements. Closers shall be barrier free. Furnish all required brackets, drop plates and any other necessary items required to insure proper operation.
- B. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be regular arm. Out-swing doors shall have a parallel arm. Regular arm shall be used in connecting doors between rooms.

## 2.4 LOCKSETS, LATCHSETS ETC.

- A. Unless otherwise noted, all locksets and latchsets shall be heavy duty mortise type, conforming to ANSI A156.13 Series 1000 Grade 1, and shall have the following features:
  - 1. Curved lip strikes with proper lip lengths as required.
  - 2. 3/4" heavy-duty anti-friction latchbolt.
  - 3. Auxiliary deadlatching.

## 2.5 KEYS, KEYING, AND CYLINDERS

- A. Keys: All keys shall be nickel silver. Furnish a quantity of keys as follows.

1. Master Keys	5
2. Change Keys	3 each per Cylinder
3. Construction Keys	5
4. Control Keys	5
- B. Keying: All locks shall be construction keyed and great grand master keyed to the existing Medeco great grand master key system. The hardware supplier is to set up a meeting with the OWNER to review the keying requirements. All master keys shall be hand delivered to the OWNER by the manufacturer or his representative.
- C. Cylinders: All cylinders shall be removable core with visual key control. Owner to furnish permanent cores.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Approval: As soon as practical after award of Contract and before a hardware schedule is prepared, and before any hardware is ordered or delivered to the project, the CONTRACTOR shall

submit to the ARCHITECT for his written approval, copies of sample list, listing each of the different items of builders hardware and catalog cuts of each item.

- B. Templates: As soon as the hardware schedule is approved the hardware supplier shall furnish to the various fabricators, required templates for fabrication purposes. Templates shall be made available not more than (10) days after receipt of the approved hardware schedule.
- C. Packaging and Marking: All hardware shall be shipped with proper fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.
- D. Delivery: Delivery shall be made to the project site to the attention of the GENERAL CONTRACTOR. Where delivery of special hardware is required at any fabricator's plant, the hardware supplier shall make such delivery.

### 3.2 INSTALLATION

- A. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by BHMA, unless otherwise noted or directed by the ARCHITECT.
- B. Install each hardware unit in compliance with the manufacturer's recommendations.

### 3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units that cannot be adjusted.
- B. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance make a final check, and adjust all hardware items in such space or area. Adjust door control devices and compensate for final operation of heating and ventilating equipment.
- C. Instruct OWNERS personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

### 3.4 HARDWARE SETS

- A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards or practices, or to meet state and local codes or proper door operation shall be furnished whether or not specifically called out in the following listed groups.
- B. Items as specified in hardware sets are to be the products of the manufacturer's listed.

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HARDWARE SET #1

Each to have:

Hinges	Bommer (see description) x US32D
1 Exit Device	Precision 1101 x US26D
1 Door Closer	Norton CLP7500 series x Alum

HARDWARE SET #2

Each to have:

2 Continuous Hinges	Zero 910DBAA
1 Lockset	Corbin ML2057 x NSA x US32D
1 Master Keyed Cylinder	Medeco (to suit) x US26D
2 Flush Bolts	Rockwood 555 x US26D
1 Door Closer	Norton CLP7500 x HO x Alum
1 Astragal	Rockford Z6
2 Silencers	GJ 64

HARDWARE SET #3

Each to have:

Re-use existing hardware

HARDWARE SET #4

Each to have:

Hinges	Bommer (see description) x US32D
1 Lockset	Corbin ML2057 x NSA x US32D
1 Master Keyed Cylinder	Medeco (to suit) x US26D
2 Flush Bolts	Rockwood 555 x US26D
1 Door Closer	Norton CLP7500 x HO x Alum
1 Astragal	Rockford Z6
2 Silencers	GJ 64

HARDWARE SET #5

Each to have:

Hinges	Bommer (see description) x US32D
1 Lockset	Corbin ML2057 x NSA x US32D
1 Master Keyed Cylinder	Medeco (to suit) x US26D
1 Door Closer	Norton CLP7500 x HO x Alum
1 Lock Guard	Rockwood 320 x US32D
3 Silencers	GJ 64

END OF SECTION 08710

## SECTION 08950 - TRANSLUCENT WALL ASSEMBLIES

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes: Translucent wall assemblies, including:
  - 1. Insulated translucent wall panel system including aluminum framing, battens, closures, trim and flashings.
- B. Related Sections: Section(s) related to this section include:
  - 1. Division 8 Section “Hangar Door Refurbishing.”
  - 2. Division 7 Section “Sealants”

#### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM C509 - Cellular Elastomeric Performed Gasket and Sealing Material.
  - 2. ASTM C864 - Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
  - 3. ASTM E283 - Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
  - 3. ASTM E330 - Structural Performance of Exterior Windows, Curtainwall, and Doors by Uniformed Static Air Pressure Difference.
  - 4. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Door by Uniform Static Air Pressure Difference.
- B. Aluminum Association (AA):
  - 1. AA Specifications for Aluminum Structures.
- C. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA 501 - Methods for Test for Metal Curtain Walls.
  - 2. 603-98 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
  - 3. 2604-98 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
  - 4. 611-98 Specification for Anodized Architectural Aluminum.

#### 1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide translucent wall assembly system which has been manufactured, fabricated and installed to withstand loads per governing Codes and to maintain performance criteria stated by manufacturer without defects, damage or failure.
- B. Translucent Wall Assembly Performance Requirements:
  - 1. Design thrusting framing system including translucent glazing material to support the following load requirements:
    - a. As required by code.
    - b. 30 PSF positive wind load plus dead load.
    - c. 30 PSF negative wind load plus dead load.
    - d. Seismic load as required by applicable code earthquake zone for project location.

#### 1.5 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Section "Submittal Procedures."
- B. Product Data: Submit product data, including manufacturer's SPEC-DATA(TM) product sheet, for specified products. Submit test results showing compliance with requirements specified under Performance Requirements paragraph herein. Include both published data and specific data prepared for this project.
- C. Test Reports: Submit reports furnished by systems manufacturer to include certified test reports by an independent testing organization for each type and class of panel system. Reports shall verify that the material will meet all performance requirements of this specification. Previously completed test reports will be acceptable if by current manufacturer and indicative of products used on this project. Test reports required are:
  - 1. Flame Spread and Smoke Developed (ASTM E-84 by UL 723)
  - 2. Burn Extent (ASTM D-635)
  - 3. Color Difference (ASTM D-2244)
  - 4. Impact Strength (Free-falling Ball Method)
  - 5. Tensile Bond Strength (ASTM C-297) after aging by ASTM D-1037)
  - 6. Shear Bond Strength (ASTM D-1002) after 5 different aging conditions
  - 7. Beam Bending Strength (ASTM E-72)
  - 8. Insulation "U" Factor (by NFRC 100; ASTM C-236; E-1423; and C-1199)
  - 9. NFRC Certification - Optional
  - 10. Condensation Resistance Factor (AAMA 1503)
- D. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.
  - 1. Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, and details of framing members, translucent glazing materials, sealants,

fasteners, anchors, and thicknesses and types of formed flashing and closures and relationship with adjacent materials. Indicate maximum horizontal and vertical forces at rafters.

- E. Samples: Submit selection and verification samples for finishes, colors and textures.
  - 1. Aluminum Finish: Submit color charts or range samples for initial color selection. Submit finished sample of color selected for use on metal coupons. Translucent Glazing Materials: Submit a verification sample, 12" (7742 mm<sup>2</sup>), square of the specified translucent glazing material specified.
- F. Quality Assurance Submittals: Submit the following:
  - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- G. Closeout Submittals: Submit the following:
  - 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Section, Closeout Procedures. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
  - 2. Warranty: Warranty documents specified herein.

## 1.6 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project for at least five (5) consecutive years, and can show evidence of satisfactory completion of projects of similar size, scope and type.
    - a. Installer: Manufacturer of translucent wall and roof assembly system, or his authorized installer, shall coordinate system design and installation work with hangar door refurbishing contractor.
  - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and prequalifying acceptable installer.
  - 3. Manufacturer: Systems shall be manufactured by a firm with a minimum of ten years experience in the fabrication and installation of translucent wall and skylight systems.

## 1.7 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Sequence deliveries to avoid delays, but minimize onsite storage.
- D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
  - 1. Store and handle in strict compliance with manufacturer's instructions and recommendations, including storing panels on the long edge several inches above ground, blocked and under cover to prevent warping. Protect from damage from sunlight, weather, excessive temperatures and construction operations.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
  - 1. Measurements: When practical, take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress; work from "guaranteed dimensions" and allow for field trimming of perimeter flashing if taking field measurements before fabrication is not possible.

## 1.9 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official.
  - 1. System Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace work which exhibits defects in materials or workmanship. Defects are defined to include uncontrolled leakage of water, abnormal aging or deterioration, or failure to perform as required.
    - a. Warranty Period: 5 years from date of completion.
  - 2. Translucent Glazing Material Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace glazing materials which exhibit defects in materials or workmanship. Defects are defined to include fiberbloom, delamination of coating from exterior sheet or more than 8.0 Delta E units of discoloration.
    - a. Warranty Period: 10 years from date of manufacture.

## PART 2 – PRODUCTS

### 2.1 TRANSLUCENT WALL ASSEMBLIES

1. Skywall Translucent Systems, The Vistawall Group. (800) 259-7941.
  2. Kalwall Corporation: (800) 258-9777.
  3. Major Industries: (888) 759-2678
- A. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials.

### 2.2 MANUFACTURED UNITS

A. Panel Construction:

1. Provide double-faced, insulated, translucent fiberglass sandwich panels complying with the following:
  - a. Thickness: 2 3/4" (70 mm).
  - b. Grid Size: 12" x 24" (305 x 61 mm).
  - c. Grid Pattern: Shoji.
  - d. Light Transmission 20% at insulated panels, 40% at uninsulated panels.
  - e. Exterior Sheet: 0.070" thick; Crystal as selected from manufacturer's standard colors.
  - f. Interior Sheet: 0.045" thick; White as selected from manufacturer's standard colors.
2. Fabricate panels as a true sandwich panel of flat fiberglass sheet bonded to a grid core of mechanically interlocking aluminum I-beams, laminated under a controlled process of heat and pressure.
  - a. Adhesive bonding line shall be straight, cover the entire width of the I-beam and have neat, sharp edge.
  - b. White spots at intersections of muntins and mullions shall not exceed 4 for each 50 sq ft (4.65 m<sup>2</sup>) of panel, nor be more than 3/64" (1.19 mm) in width.
3. Panel Performance:
  - a. Deflection: Not to exceed 3 1/2" (89 mm) at 34 lb per sq ft (166 kg/m<sup>2</sup>) loading, and not to exceed 0.090" mm) set deflection after 5 minutes per ASTM E72 on a 4' x 12' (1.22 x 3.66 mm) panel.
  - b. Support Strength: Panel capable of supporting, without failure, a 300 lb (136.2 kg) concentrated load when applied to a 3" (76.2 mm) diameter disk per ASTM D661.

B. Components and Accessories:

1. Structure: Extruded aluminum alloy 6063-T5 or 6061-T6 box beams.
2. Grid Core: Aluminum I-beams, minimum 7/16" (11.1 mm) width, fabricated of extruded aluminum alloy 6063-T6 with provision for mechanical interlocking of muntin/mullion and perimeter which prevents high and low intersections which do not allow full bonding surface to contact with face material.
3. Translucent Facing: Fiberglass panels manufactured with uniform color, free of ridges, wrinkles, clusters of air bubbles and pinholes, with the following characteristics:
  - a. Flammability for Interior Face Sheet: Flamespread no greater than 20 and smoke developed no greater than 200 per ASTM E84. Burn extent no greater than 1" (25.4 mm) per ASTM D63.
  - b. Protective Coating on Exterior Face Sheet: 1 mil thick DuPont Tedlar, factory applied by licensed sheet manufacturer for architectural use. Coating shall be fully field refinishable if damaged.
  - c. Weatherability of Exterior Face Sheet: Not more than 4.0 units of color difference Delta E per ASTM D2244 after 5 years outdoor weathering in South Florida at 45 degrees facing south per ASTM D1435. Fabricate from colorfast resin.
  - d. Strength of Exterior Face Sheet: Uniform and strength and repel an impact equal to 60 ft-lb per Free Falling Ball test.
4. Battens and Perimeter Closure Systems: Extruded aluminum alloy 6063-T6 or 6063-T5, for screw clamp-tight closure system. Fasten to panels with Type 304 self-tapping stainless steel screws. Receiving channels for screws shall be continuous, with length of each member extruded as part of the member.
  - a. Frame: Thermally broken frame system.
5. Flexible Sealing Tape: Manufacturer's standard sealing tape, pre-applied to closure system at factory under controlled conditions.

2.3 RELATED MATERIALS

- A. Related Materials: Refer to other sections listed in Related Sections paragraph herein for related materials.

2.4 FINISHES (FACTORY)

- A. Aluminum Finishes: Provide the following finish for interior and exterior exposed aluminum surfaces:
1. Fluoropolymer Coating: Two coat, 70% Kynar 500/Hylar 5000 resin base fluoropolymer finish complying with MAMA 2604-98. standard color as selected.
- B. Source Quality: Obtain translucent wall and roof assembly materials from a single manufacturer.

## PART 3 – EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

### 3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions which have been previously installed under other sections are acceptable for product installation in accordance with manufacturer's instructions. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed and notify Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

### 3.3 INSTALLATION

- A. Translucent Wall Assembly Installation:

1. Match profiles, sizes and spacings indicated on approved shop drawings. Ensure that weep and condensation control system operates properly.
2. Coordinate installation with hangar door structure, liner panels, and other hangar elements to ensure creation of a complete weatherproof assembly. Anchor work securely to supporting structure, but allow for differential and thermal movement.
3. Isolate between aluminum and dissimilar metals with a protective coating or plastic strip to prevent electrolytic corrosion.

### 3.4 ADJUSTING

- A. Adjusting: During installation, remove labels, part number markings, sealant smears, handprints and construction dirt from all components. Touch up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired.

### 3.5 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
  1. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned.
  2. Reclean as necessary to prevent damage.

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### 3.6 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.
  - 1. Protect completed work from damage and deterioration and inspect immediately before final acceptance of project.

END OF SECTION 08950

## SECTION 09912 - PAINTING (PROFESSIONAL LINE PRODUCTS)

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Finished mechanical and electrical equipment.
    - b. Light fixtures.
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Utility tunnels.
    - c. Pipe spaces.
    - d. Duct shafts.
  - 3. Finished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.

- d. Copper and copper alloys.
  - e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
- a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
- D. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- E. Related Sections include the following:
- 1. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.

### 1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

### 1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
- 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Initial Selection: For each type of finish-coat material indicated.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
- 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

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2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.

D. Qualification Data: For Applicator.

#### 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
  1. Product name or title of material.
  2. Product description (generic classification or binder type).
  3. Manufacturer's stock number and date of manufacture.
  4. Contents by volume, for pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
  8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.
  1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

#### 1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

D. Conform to manufacturer's written instructions for application of paint systems.

## 1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Contraction Officer.

1. Quantity: Furnish Contraction Officer with an additional 5 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).
2. Coronado Paint Company (Coronado).
3. ICI Dulux Paint Centers (ICI Dulux Paints).
4. PPG Industries, Inc. (Pittsburgh Paints).
5. Sherwin-Williams Co. (Sherwin-Williams).

### 2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

- C. Colors: As selected by Contracting Officer from manufacturer's full range.

## 2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
  1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than 8.1 mils (0.206 mm).
  2. Coronado; 946-11 Super Kote 5000 Commercial Latex Block Filler: Applied at a dry film thickness of not less than 8.4 mils (0.214 mm).
  3. ICI Dulux Paints; Bloxfil 4000-1000 Interior/Exterior Heavy Duty Acrylic Block Filler: Applied at a dry film thickness of not less than 7.0 to 14.5 mils (0.178 to 0.368 mm).
  4. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils (0.152 to 0.318 mm).
  5. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils (0.203 mm).

## 2.4 EXTERIOR PRIMERS

- A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
  1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  3. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer. Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  4. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  5. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- B. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
  1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  2. Coronado; 36-11 Rust Scat Latex Metal Primer: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
  3. ICI Dulux Paints; 4020-XXXX Devflex DTM Flat Interior/Exterior Waterborne Primer & Finish: Applied at a dry film thickness of not less than 2.2 mils (0.056 mm).
  4. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  5. Sherwin-Williams; primer not required over this substrate.

## 2.5 INTERIOR PRIMERS

- A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
  2. Coronado; 40-11 Super Kote 5000 Latex Primer-Sealer: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
  3. ICI Dulux Paints; 3030-1200 Bond-Prep Interior/Exterior Waterborne Pigmented Bonding Primer: Applied at a dry film thickness of not less than 1.8 mils (0.046 mm).
  4. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  5. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- B. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  3. ICI Dulux Paints; 4130-6130 Devshield Rust Penetrating Metal Primer: Applied at a dry film thickness of not less than 2.2 mils (0.056 mm).
  4. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  5. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  6. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- C. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  2. Coronado; 36-11 Rust Scat Acrylic Metal Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  3. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
  4. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
  5. Sherwin-Williams; primer not required over this substrate.

## 2.6 EXTERIOR FINISH COATS

- A. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.
1. Benjamin Moore; Moorcraft Super Spec Latex House & Trim Paint No. 170: Applied at a dry film thickness of not less than 1.1 mils (0.028 mm).
  2. Coronado; 12-Line Supreme Acrylic Semi-Gloss: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  3. ICI Dulux Paints; 2406-XXXX Dulux Professional Exterior 100 Percent Acrylic Semi-Gloss Finish: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
  4. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  5. Sherwin-Williams; A-100 Latex Gloss A8 Series: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).

## 2.7 INTERIOR FINISH COATS

- A. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. 274: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
  2. Coronado; 30-Line Super Kote 5000 Latex Eggshell Enamel: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
  3. ICI Dulux Paints; 1402-XXXX Dulux Professional Acrylic Eggshell Interior Wall & Trim Enamel: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
  4. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils (0.032 mm).
  5. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- B. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).
  2. Coronado; 32-Line Super Kote 5000 Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
  3. ICI Dulux Paints; 1406-XXXX Dulux Professional Acrylic Semi-Gloss Interior Wall & Trim Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
  4. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
  5. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
  - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify Contracting Officer about anticipated problems when using the materials specified over substrates primed by others.

#### 3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and

burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
  4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
  2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  3. Provide finish coats that are compatible with primers used.
  4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  2. Omit primer over metal surfaces that have been shop primed and touchup painted.
  3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
  2. Uninsulated plastic piping.
  3. Pipe hangers and supports.
  4. Tanks that do not have factory-applied final finishes.

5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
8. Other items as specified in Mechanical specification.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
4. Other items as specified in Electrical specifications.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### 3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

### 3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

### 3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.7 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
- B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.

### 3.8 INTERIOR PAINT SCHEDULE

- A. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- B. Ferrous Metal: Provide the following finish systems over ferrous metal:
  - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

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- a. Primer: Interior ferrous-metal primer.
  - b. Finish Coats: Interior semigloss acrylic enamel.
2. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
  - a. Primer: Interior ferrous-metal primer.
  - b. Finish Coats: Interior full-gloss acrylic enamel.
- C. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
  1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior zinc-coated metal primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- D. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
  1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coats: Interior flat latex-emulsion size.

END OF SECTION 09912

## SECTION 10200 - LOUVERS AND VENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Fixed, extruded-aluminum louvers.
- B. Related Sections include the following:
  - 1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
  - 2. Division 15 Sections for louvers that are a part of mechanical equipment.

#### 1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.
  - 1. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
- B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

#### 1.5 SUBMITTALS

A. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

1. For installed louvers and vents indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

#### 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

#### 1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Louvers:

a. Airline Products Co.

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- b. Airolite Company (The).
- c. American Warming and Ventilating, Inc.
- d. Arrow United Industries.
- e. Carnes Company, Inc.
- f. Cesco Products.
- g. Construction Specialties, Inc.
- h. Dowco Products Group; Safe-Air of Illinois, Inc.
- i. Greenheck.
- j. Industrial Louvers, Inc.
- k. Louvers & Dampers, Inc.
- l. Metal Form Manufacturing Company, Inc.
- m. NCA Manufacturing, Inc.
- n. Nystrom Building Products.
- o. Reliable Products; Hart & Cooley, Inc.
- p. Ruskin Company; Tomkins PLC.
- q. Vent Products Company, Inc.

## 2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.
- D. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
  - 1. Use types and sizes to suit unit installation conditions.

## 2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  - 1. Frame Type: Channel , unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.

- E. Where indicated, provide subsills made of same material as louvers for recessed louvers.
- F. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

#### 2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. High Performance Horizontal, Continuous-Line, Drainable-Blade Louver:
  - 1. Basis-of-Design Product: Ruskin ELF 375DX or approved equal subject to compliance with the following:
    - 2. Louver Depth: 4 inches (100 mm) .
    - 3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch (2.0 mm).
    - 4. Performance Requirements:
      - a. Free Area: Nominal 55%.
      - b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 700-fpm (3.6-m/s) free-area velocity.
      - c. Wind-Driven Rain Performance: Not less than percent effectiveness when subjected to a rain fall rate of 3 inches (75 mm) per hour and a wind speed of 29 mph (13 m/s) at a core area intake velocity of 500 fpm (2.5 m/s).
  - 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
  - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
  - 2. Finish: Same finish as louver frames to which louver screens are attached.
  - 3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.
- D. Louver Screening for Aluminum Louvers:
  - 1. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.
- E. Insulated, Blank-off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets.
  - 1. Thickness: 1 inch (25 mm).

2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.8-mm) nominal thickness.
3. Insulating Core: Unfaced mineral-fiber or foamed-plastic rigid insulation board.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch (2.0-mm) nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with 1/8-by-1-inch (3.2-by-25-mm) PVC compression gaskets.
6. Panel Finish: Same finish applied to louvers.

## 2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish louvers after assembly.

## 2.6 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
  1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
    - a. Color and Gloss: As selected by Contracting Officer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

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- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

#### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 10200

## SECTION 10520 - FIRE-PROTECTION SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers.
- B. Owner-Furnished Material: Fire extinguishers.

#### 1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
  - 1. Fire-Protection Cabinets: Include details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

#### 1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Fire End & Croker Corporation.
  - 2. General Accessory Mfg. Co.
  - 3. JL Industries, Inc.
  - 4. Kidde Fyrnetics.
  - 5. Larsen's Manufacturing Company.

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6. Modern Metal Products; Div. of Technico.
7. Moon American.
8. Potter Roemer; Div. of Smith Industries, Inc.
9. Watrous; Div. of American Specialties, Inc.

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, 3 mm thick.

## 2.3 FIRE-PROTECTION CABINET

- A. Cabinet Construction: 1-hour fire rated.
- B. Cabinet Material: Stainless-steel sheet.
- C. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall; with no trim.
- D. Door Material: Stainless-steel sheet .
- E. Door Style: Center glass panel with frame .
- F. Door Glazing: Clear float glass .
- G. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  1. Provide manufacturer's standard.
  2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- H. Accessories:
  1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
  3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
  4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Contracting Officer.

- a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
5. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

## 2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  1. Weld joints and grind smooth.
  2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
    - a. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
  1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
  2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 STAINLESS-STEEL FINISHES

- A. General: Remove tool and die marks and stretch lines or blend into finish.

1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Satin, Directional Polish: No. 6 finish.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
  1. Fire-Protection Cabinets: 42 inches (1372 mm) above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
- C. Identification: Apply vinyl lettering at locations indicated.

#### 3.2 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10520

## SECTION 13125 - METAL BUILDING SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Structural framing.
2. Roof panels.
3. Wall panels and liners.
4. Insulation.
5. Building components.
6. Accessories and trim.

#### 1.2 RELATED SECTIONS

A. See Division 3 Section "Cast-in-Place Concrete" for concrete foundations and anchor-bolt installation.

#### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, roof and wall panels, and accessories complying with requirements indicated.
- B. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Engineer metal building systems according to procedures in MBMA's "Low Rise Building Systems Manual."
  2. Design Loads: Per governing building code, but not less than that shown.
- C. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project.
- D. Thermal Movements: Provide metal building roof and wall panel systems that allow for thermal movements resulting from maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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- E. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements in UL 580 for Class 90 wind-uplift resistance.
- F. Lateral Drift: Maximum lateral drift of the frame shall not exceed  $H/100$  under any design load combination.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of metal building system component indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, structural framing, roof and wall panel layout, and attachments to other Work.
  - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the jurisdiction where the project is located.
  - 2. Anchor-Bolt Plans: Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
- C. Samples: For the following, in the profile and style indicated, if applicable:
  - 1. Roof panels.
  - 2. Wall panels and liners.
  - 3. Trim and closures.
  - 4. Vapor retarders.
  - 5. Accessories.
- D. Letter of Design Certification: Signed and sealed by a qualified professional engineer registered in the State of Connecticut. Include the following:
  - 1. Name and location of Project.
  - 2. Order number.
  - 3. Name of manufacturer.
  - 4. Name of Contractor.
  - 5. Building dimensions, including width, length, height, and roof slope.
  - 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
  - 7. Governing building code and year of edition.
  - 8. Design loads and load combinations.
  - 9. Building-use category.
  - 10. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.
- E. Welding certificates.
- F. Erector Certificates: Signed by manufacturer certifying that erector complies with requirements.

- G. Manufacturer certificate.

#### 1.5 QUALITY ASSURANCE

- A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- B. Manufacturer Qualifications: A firm experienced in manufacturing metal building systems similar to those indicated for this Project and with a record of successful in-service performance.
  - 1. Member of MBMA.
  - 2. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
  - 3. Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. Regulatory Requirements: Fabricate and label structural framing to comply with special inspection requirements at point of fabrication for welding and other connections required by authorities having jurisdiction.
- E. Structural Steel: Comply with AISC S335, "Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design," for design requirements and allowable stresses.
- F. Cold-Formed Steel: Comply with AISI SG-671, "Specification for the Design of Cold-Formed Steel Structural Members," and for design requirements and allowable stresses.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof and wall panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.7 COORDINATION

- A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

## 1.8 WARRANTY

- A. Special Warranty on Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace roof and wall panels that fail in materials or workmanship within three years from date of Substantial Completion.
- B. Warranties shall cover all materials and all labor to correct leaks and other defects with a limit of the full installed cost of the roof system.
- C. Special Warranty on Roof and Wall Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
- D. Special Warranty on Standing-Seam Roof Panel Weathertightness: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam roof panel assemblies that fail to remain weathertight within 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Members of MBMA.

### 2.2 STRUCTURAL-FRAMING MATERIALS

- A. Structural-Steel Shapes: ASTM A 993 or ASTM A 529/A 529M.
- B. Steel Plate, Bar, or Strip: ASTM A 529/A 529M, ASTM A 570/A 570M, or ASTM A 572/A 572M; 50,000-psi (345-MPa) minimum yield strength.
- C. Steel Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53, Grade B.
- D. Structural-Steel Sheet: Hot-rolled, ASTM A 570/A 570M, Grade 50 or Grade 55; hot-rolled, ASTM 568/A 568M; or cold-rolled, ASTM A 611, structural-quality, matte (dull) finish.
- E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G60 (Z180) coating designation; mill phosphatized.
- F. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.

2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating, Grade 40 (Class AZ150 coating, Grade 275); structural quality.
- G. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- H. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
  2. Direct-Tension Indicators: ASTM F 959, Type 325 or Type 490 (ASTM F 959M, Type 325M or Type 490M).
    - a. Finish: Hot-dip zinc coating, ASTM B 695, Class 50.
- I. Anchor Rods, Bolts, Nuts, and Washers:
1. Unheaded Rods: ASTM A 36/A 36M.
  2. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
  3. Washers: ASTM A 36/A 36M.
- J. Primers: As selected by manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
1. Primer: Manufacturer's standard, lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

## 2.3 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
  2. Surface: Smooth, flat, mill finish.
- B. Panel Sealants:
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in panels and remain weathertight; and as recommended by metal building system manufacturer.

#### 2.4 INSULATION MATERIALS

- A. Glass-Fiber-Blanket Insulation: ASTM C 991, Type I, or NAIMA 202 thermal insulation of 0.5-lb/cu. ft. (8-kg/cu. m) density, thickness as indicated, with a flame-spread index of 25 or less, and with 2-inch- (50-mm-) wide, continuous, vapor-tight edge tabs.
- B. Vapor-Retarder Facing: ASTM C 1136.
  1. Composition: Polypropylene-faced, scrim-reinforced kraft paper.
  2. Permeance: Not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96, Desiccant Method.
- C. Retainer Strips: 0.019-inch- (0.5-mm-) thick, formed, galvanized steel or PVC retainer clips colored to match insulation facing.
- D. Provide the following R-values:
  1. Roof: R-19
  2. Walls: R-13

#### 2.5 MISCELLANEOUS MATERIALS

- A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities, and formulated for 15-mil (0.4-mm) dry film thickness per coat.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107 premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, of consistency suitable for application, and with a 30-minute working time.
- C. Shop Primer for Galvanized Metal Surfaces: FS TT-P-641 zinc dust, zinc-oxide primer selected by manufacturer for compatibility with substrate.
- D. Finish Painting: Refer to Division 9 Sections.

#### 2.6 FABRICATION, GENERAL

- A. Primary Framing: Shop-fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
  1. Make shop connections by welding or by using high-strength bolts.

2. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
  3. Brace compression flange of primary framing by angles connected between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
  4. Weld clips to frames for attaching secondary framing members.
  5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.
- B. Secondary Framing: Shop-fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
  2. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime secondary structural members after fabrication.
- C. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer immediately after cleaning and pretreating.
1. Prime primary, secondary, and end-wall steel framing members for a minimum dry film thickness of 1 mil (0.025 mm).
    - a. Prime secondary steel framing formed from metallic-coated steel sheet with red-oxide polyester paint, with a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.
  2. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust, zinc-oxide primer.
- D. Tolerances: Comply with MBMA's "Low Rise Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

## 2.7 STRUCTURAL FRAMING

- A. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
  2. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipe or tube, or shop-welded, built-up steel plates.
  3. Frame Configuration: Single gable.
  4. Exterior Column Type: Tapered.

5. Rafter Type: Tapered.
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0747 inch (1.9 mm).
  2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch (1.5 mm).
- C. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet prepainted with coil coating, unless otherwise indicated.
1. Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- (1.5-mm-) thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch- (64-mm-) wide flanges.
  2. Girts: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- (1.5-mm-) thick steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 45 to 50 degrees to flange and with minimum 2-1/2-inch- (64-mm-) wide flanges.
  3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch- (1.5-mm-) thick steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for both roof and wall panels.
  4. Flange and Sag Bracing: Minimum 1-5/8-by-1-5/8-inch (41-by-41-mm) structural-steel angles, with a minimum thickness of 0.0598 inch (1.5 mm), to stiffen primary frame flanges.
  5. Base or Sill Angles Channels: Minimum 3-by-2-by-0.0747-inch (76-by-51-by-1.9-mm) zinc-coated (galvanized) steel sheet.
  6. Purlin and Girt Clips: Minimum 0.0747-inch- (1.9-mm-) thick, zinc-coated (galvanized) steel sheet.
  7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0747-inch- (1.9-mm-) thick, zinc-coated (galvanized) steel sheet.
  8. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch- (1.5-mm-) thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
  9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- D. Bracing: Adjustable wind bracing.
1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade D; or ASTM A 529/A 529M, Grade 50; 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 12 inches (300 mm) at each end.

- E. Bolts: Provide shop-painted bolts unless structural-framing components are in direct contact with roof and wall panels. Provide zinc-plated bolts when structural-framing components are in direct contact with roof and wall panels.

## 2.8 ROOF PANELS

- A. Standing-Seam, Ribbed Roof Panels: Fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed to provide 24-inch (610-mm) coverage; with 3-inch- (76-mm-) high (including seam), raised trapezoidal major ribs at panel edges, and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel.
  - 1. Material: Aluminum-zinc alloy-coated steel.
  - 2. Metal Thickness: 0.0239 inch (0.60 mm).
  - 3. Joint Type: Double-folded, mechanically seamed type.
  - 4. Clip System: Floating to accommodate thermal movement.
- B. Roof Panel Accessories: Provide components required for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of roof panels, unless otherwise indicated.
  - 1. Clips: Minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel panel clips designed to withstand negative-load requirements.
  - 2. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch- (0.65-mm-) thick, stainless-steel or nylon-coated aluminum sheet.
  - 3. Thermal Spacer Blocks: Where panels attach directly to purlins, provide 1-inch- (25-mm-) thick, thermal spacer blocks; fabricated from extruded polystyrene.
- C. Exterior Finish: Coil coating.
  - 1. Fluoropolymer System: 2-coat, thermocured system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 1 mil (0.025 mm) and 30 percent reflective gloss when tested according to ASTM D 523.
  - 2. Colors, Textures, and Glosses: As selected from manufacturer's full range.
- D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil (0.013 mm).

## 2.9 WALL PANELS

- A. Uninsulated Wall Panels: Manufacturer's standard panels.
  - 1. Ribbed Panels (Exterior): Fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed to provide 36-inch (914-mm) coverage, with raised trapezoidal major ribs at 12 inches (305 mm) o.c., and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel. Design panels for

mechanical attachment to structure using exposed fasteners, lapping major ribs at panel edges.

- a. Material: Zinc-coated (galvanized) steel.
  - b. Metal Thickness: 0.0179 inch (0.45 mm) 0.0239 inch (0.60 mm).
  - c. Panel Depth: 1.250 inches (32 mm).
  - d. Profile and color to match Morin Corporation "Y-29", "Spartan Bronze," as located on adjacent buildings.
2. Interior Wall Panel Liners: Steel Face Sheet: Interior Face Sheet: 0.022-inch- (0.55-mm) thick, metallic-coated steel sheet with organic coating finish, unless otherwise indicated. Profile and color to match Morin Corporation "L2-24-5F", "Ascot White."
- B. Wall Panel Accessories: Provide components required for a complete wall panel assembly, including trim, copings, mullions, sills, corner units, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
- C. Exposed Finish for Exterior Panels: Coil coating.
1. Fluoropolymer System: 2-coat, thermocured system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 1 mil (0.025 mm) and 30 percent reflective gloss when tested according to ASTM D 523.
  2. Colors, Textures, and Glosses: To match Morin Corporation "Y-29", "Spartan Bronze," and adjacent buildings"
- D. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil (0.013 mm).

## 2.10 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer. Provide sheet metal accessories of same material and in same finish as roof and wall panels, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of roof or wall sheets by means of plastic caps or factory-applied coating.
1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
  2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- C. Flashing and Trim: Form from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations

include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent roof or wall panels.

1. Opening Trim: Minimum 0.028-inch- (0.7-mm-) thick steel sheet. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- D. Gutters: Form from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36 inches (900 mm) o.c., fabricated from same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish gutters to match roof fascia and rake trim.
- E. Downspouts: Form from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; in 10-foot- (3-m-) long sections, complete with formed elbows and offsets. Finish downspouts to match wall panels.
- F. Louvers: Refer to Division 10 Section "Louvers and Vents."
- G. Closures: Closed-cell, laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match roof and wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- H. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

## 2.11 SOURCE QUALITY CONTROL

- A. Owner will employ an independent testing agency to perform source quality-control testing and special inspections, and to prepare test reports.
  1. Special inspections will not be required when fabrication is performed by a fabricator registered and approved by authorities having jurisdiction to perform such work without special inspection.
- B. Shop-bolted connections will be tested and inspected according to RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.
- C. In addition to visual inspection, shop welding will be inspected and tested according to AWS D1.1.

## PART 3 - EXECUTION

### 3.1 ERECTION

- A. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces, baseplates, and anchor bolts to receive structural framing. Verify compliance with requirements and metal building system manufacturer's tolerances.
- B. Erect metal building system according to manufacturer's written instructions and erection drawings.
- C. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- D. Set structural framing in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- E. Baseplates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces before setting baseplates and bearing plates. Clean bottom surface of baseplates and bearing plates.
- F. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
- G. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.
  - 1. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.
- H. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts. Hold rigidly to a straight line by sag rods.
  - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
  - 2. Locate and space wall girts to suit door and window arrangements and heights.
  - 3. Locate canopy framing as indicated.
  - 4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod bracing to avoid sag.
  2. Locate interior end bay bracing only where indicated.
- J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.
- K. Structural-Steel Erection Tolerances: Comply with erection tolerance limits in AISC S303, "Code of Standard Practice for Steel Buildings and Bridges."

### 3.2 ROOF PANEL INSTALLATION

- A. General: Provide roof panels of full length from eave to ridge when possible. Install panels perpendicular to purlins.
1. Rigidly fasten eave end of roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels.
  2. Provide weatherseal under ridge cap.
  3. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  4. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.
  5. Locate panel splices over, but not attached to, structural supports. Stagger panel splices to avoid a four-panel lap splice condition.
- B. Standing-Seam Roof Panels: Fasten roof panels to purlins with concealed clips at each standing-seam joint. Install clips over top of insulation at location and spacing determined by manufacturer.
1. Install clips to supports with self-drilling fasteners.
  2. Crimp standing seams with manufacturer-approved motorized seamer tool so clip, panel, and factory-applied side-lap sealant are completely engaged.
  3. At panel splices, nest panels with minimum 6-inch (150-mm) end lap, sealed with butyl sealant and fastened together by interlocking clamping plates.

### 3.3 WALL PANEL INSTALLATION

- A. General: Provide panels full height of building when possible. Install panels perpendicular to girts.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
  2. Unless otherwise indicated, begin panel installation at corners with center of rib lined up with line of framing.
  3. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws.
  4. Fasten flashing and trim around openings and similar elements with self-tapping screws.

5. When 2 rows of panels are required, lap panels 4 inches (100 mm) minimum. Locate panel splices over structural supports.
6. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
7. Provide weather-resistant escutcheons for pipe and conduit penetrating exterior walls.
8. Flash and seal wall panels with weather closures under eaves and rakes, along lower panel edges, and at perimeter of all openings.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and backup according to sealant manufacturer's written instructions.
10. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.

- B. Field-Assembled, Insulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with fasteners as recommended by manufacturer. Install insulation as specified below, and cover with liner panels.
- C. Uninsulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with fasteners as recommended by manufacturer.

#### 3.4 INSULATION INSTALLATION

- A. General: Install insulation concurrently with panel installation, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
  2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- B. Blanket Insulation: Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths with both sets of facing tabs sealed to provide a complete vapor retarder. Comply with the following installation method:
1. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Install layer of filler insulation over first layer to fill space formed by roof panel standoffs. Hold in place by panels fastened to standoffs.
  2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

#### 3.5 DOOR INSTALLATION

- A. General: Seal perimeter of each door frame with elastomeric sealant used for panels.
- B. Personnel Doors and Frames: Install doors and frames straight, level, and plumb. Securely anchor frames to building structure. Set units with maximum 1/8-inch (3-mm) clearance

between door and frame at jambs and head and maximum 3/4-inch (19-mm) clearance between door and floor.

- C. Door Installation Tolerances: Fit doors in frames within clearances specified in SDI 100.
- D. Adjusting: After completing installation, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion.

### 3.6 ACCESSORY INSTALLATION

- A. General: Install gutters, downspouts, ventilators, and other accessories with positive anchorage to building and weathertight mounting. Coordinate installation with flashings and other components.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - 1. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection.
  - 2. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet (1.2 m) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
  - 1. Tie downspouts to underground drainage system indicated.
- E. Pipe Flashing: Form flashing around pipe penetration and roof panels. Fasten and seal to roof panel as recommended by manufacturer.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing agency to perform field quality-control testing.
- B. Extent and Testing Methodology: Testing and verification procedures will be required of high-strength bolted connections.

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1. Bolted connections will be visually inspected.
2. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

### 3.8 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean, prepare, and prime or reprime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates.

1. Apply compatible primer of same type as shop primer used on adjacent surfaces.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Roof and Wall Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

1. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13125

## SECTION 13220 - SURFACE WATER-STORAGE TANKS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes bolted-steel reservoirs for storage of fire-suppression water. All appurtenances required per NFPA 22 and tank insulation.

#### 1.3 DEFINITIONS

- A. Reservoir: Flat-bottomed, cylindrical, surface water-storage tank with shell height equal to or less than its diameter.
- B. CR: Chlorosulfonated polyethylene synthetic rubber.
- C. NR: Natural rubber.
- D. PVC: Polyvinyl chloride plastic.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Surface water-storage tank, including structural reinforcement and foundation, shall be capable of withstanding the effects of dead and live gravity loads and winds of 100 mph (161 km/h).
- B. Seismic Performance: Surface water-storage tank, including structural reinforcement and foundation, shall be capable of withstanding the effects of earthquake motions. Refer to structural drawings for requirements.
- C. Thermal Movements: Surface water-storage tank, including structural reinforcement and foundation, shall allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base Contracting Officer's calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F (67 deg C); 180 deg F (100 deg C), material surfaces.

## 1.5 SUBMITTALS

- A. Product Data: Include rated capacities, accessories, appurtenances, and furnished specialties for surface water-storage tank indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional Contracting Officer. Show fabrication and installation details for each surface water-storage tank, including the following:
  - 1. Tank, roof, and shell openings.
  - 2. Safety railings and ladders.
  - 3. Plans, elevations, sections, details, and attachments to other Work.
  - 4. Structural analysis data signed and sealed by the qualified professional Contracting Officer registered in the State of Connecticut responsible for their preparation.
  - 5. Foundation plans.
  - 6. Tank insulation.
- C. Drawings and Specifications
  - 1. Construction shall be governed by the drawings and specifications showing general dimensions and construction details. After approval by the Contracting Officer of detailed erection drawings prepared by the manufacturer, there shall be no deviation from these drawings and specifications except upon written order or approval from the Contracting Officer.
  - 2. Six (6) copies of the shop drawings covering tank, anchors, accessories, appurtenances and coatings provided shall be submitted in accordance with the "Submittals" and "Drawings and Specification" sections.
- D. Qualifications of Tank Manufacturer
  - 1. The tank manufacturer shall be a specialist in the design, fabrication and erection of factory-coated bolted steel tanks. The manufacturer shall be quality-certified, having an active API-Q1 and an ISO 9001 registration.
- E. Welding certificates.
- F. Qualification Data: For fabricator.
- G. Bacteriological test results.
- H. Field quality-control test reports.
- I. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:
  - 1. Cathodic protection.

## 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employ a qualified structural Contracting Officer to prepare calculations, Shop Drawings, and other structural data for fabrication and erection of surface water-storage tanks and foundation design.
  - 1. Contracting Officer Responsibility: Preparation of data for surface water-storage tanks, accessories, specified appurtenances, and concrete supports and foundations, including Shop Drawings, based on testing and Contracting Officer analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Structural Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- C. Pipe Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with AWWA D103, "Factory-Coated Bolted Steel Tanks for Water Storage," and AWWA M42, "Steel Water-Storage Tanks," for bolted-steel, surface water-storage tanks.
- F. Comply with NFPA 22, "Water Tanks for Private Fire Protection," for surface water-storage tanks for fire-suppression water supply.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 BOLTED-STEEL RESERVOIRS

### A. Available Manufacturers:

1. American Tank Company, Inc.
2. Columbian Steel Tank Company.
3. Pittsburg Tank & Tower Co., Inc.
4. Smith, A. O. Contracting Officered Storage Products Company.
5. Superior Tank Co., Inc.

### B. The following bolted steel tank and accessories shall be equal to Columbian Steel Tank Company, Kansas City, Kansas.

### C. Description

1. Product to be stored: Water for fire service
2. Specific gravity: 1.0
3. Temperature of product: Ambient
4. Nominal capacity: 150,000 gallons
5. Diameter: 32 feet, 8 inches
6. Maximum depth: 24 feet, 1.5 inches
7. Deck live load: 25 psf

### D. References

1. AWWA D103- Bolted steel tank fabrication and erection
2. API 12B - Principles of standard specification for bolted steel tank
3. Factory Mutual - Fire protection tanks
4. NFPA 22 - Chapter 4 - Water tanks for private fire protection, factory-coated, bolted steel tanks

### E. Tank Structure

The materials, design, fabrication, and erection of the bolted steel tank shall conform to AWWA D103, to the Principles of Standard Specification 12B of the American Petroleum Institute, or to these specifications which are derived from Contracting Officering principles, industry experiences, and the aforementioned standards and specifications.

#### 1. Steel

- a. Sheet: Steel sheets shall conform to or shall be at least equal to hot-rolled quality per ASTM A570 Grade 33 with a minimum yield strength of 33,000 psi. Mini-mum thickness shall be 12 gauge (0.0972" minimum).
- b. Plate: Steel plates shall conform to or at least be equal to the requirements of ASTM A36 with a minimum yield strength of 36,000 psi.

c. Rolled Structural Shapes: Rolled structural shapes shall conform to ASTM A36.

2. Bolts

- a. Galvanized bolts, nuts and washers used in tank joints shall be minimum 1/2 inch bolt diameter and shall meet the minimum requirements of API 12B, Appendix A, except that bolt heads and nuts may be other than square at the option of tank manufacturer.
- b. Polycapped bolt heads shall be used for additional corrosion protection.
- c. Other bolts shall conform to or at least be equal to the latest revision of ASTM A307.
- d. Additionally, any steel nuts that are in contact with the liquid in the tank shall be factory-encapsulated so that the nut forms one piece with the corrosion-resistant encapsulating material.

3. Gaskets

All bolted connections shall incorporate an EPDM or prefabricated gasket minimum width 1-3/4". A single piece double-punched gasket shall be used at vertical seams which require two vertical rows of punching. Field caulking will be allowed when joining a discontinuous gasket section and at certain joint connections. Neoprene-backed steel washers shall be provided at all bolts in contact with the stored liquid.

4. Multiple Row Punching

All sheets in the shell of the tank that require multiple vertical row punching (double or triple) must be in a single stroke to insure proper alignment.

3. Coating

- a. All metal plates, supports, members, and miscellaneous parts, except bolts, certain accessories, and appurtenances, shall be factory-coated in accordance with the provisions of these specifications. Field coating, except for touch-up will not be permitted.
- b. Interior: Thermally cured epoxy Trico-Bond 478 by Columbian Steel Tank Company or equal.
- c. Exterior: Amine epoxy primer with baked acrylic finish coat or equal.

F. Surface Preparation

1. Tank parts shall be thoroughly washed and rinsed to remove grease, oil and foreign matter.
2. Parts shall be then immediately oven-dried.
3. Parts shall be grit-blasted to SSPC-SP10-63T (near white blast cleaning) to 2-3 mils profile.
4. All parts shall be coated within 15 minutes after blasting, and no further processing other than coating application shall be done.

G. Interior Coating/Trico-Bond 478 (Includes underneath side of steel bottom)

1. First coat electrostatic application of NSF-approved thermoset epoxy, Technical Coatings Company Epicon 925 as primer, 2.5 mils average dry film thickness.
  2. Second coat electrostatic application of NSF-approved thermoset epoxy, Technical Coatings Company Epicon 925 as topcoat, 2.5 mils average dry film thickness.
  3. Coating system to have 5.0 mils average dry film thickness.
- H. Exterior Coating -- Columbian standard Trico-Bond 478 and acrylic enamel finish
1. One coat epoxy primer, Technical Coatings Company Epicon 925, 2 mils average dry film thickness, electrostatically applied.
  2. One coat high solids acrylic baking enamel, Technical Coatings Company #894-N-006 Tan, 1 mil average dry film thickness.
  3. Coating system to have 3 mils average total dry film thickness.
- I. Drying and Shipping Coated Parts
1. Curing
    - a. Baking ovens shall be used after each coat. Final coat shall be cured in bake oven for at least 15 minutes.
  2. Preparation for Transport
    - a. Material shall be marked or tagged with part number and order number for field assembly requirements.
    - b. Tank material shall be placed in racks or on pallets to facilitate transportation to jobsite and prevent scratching by erection crews.
    - c. Touch-up paint with instructions for application by erection personnel.
- J. Appurtenances
1. The Contractor shall furnish and install all the appurtenances as required per NFPA 22, whether or not shown on the drawings or specified below.
  2. Unless otherwise noted, standard appurtenances shall be as follows:
    - a. Hatch: The tank roof hatch shall have a curbed, upward opening 24" square. The curb shall extend at least four inches above the tank. The hatch cover lip shall be hinged and provisions made for locking. The hatch cover lip shall extend for a distance of two inches down on the outside of the curb.
    - b. Inlet and Outlet Connections: Inlet, outlet, and overflow connections shall conform to the sizes and locations specified on the drawings.
    - c. Vent: A mushroom-screened vent shall be furnished above maximum water level of sufficient size to accommodate normal inlet and outlet flow. The overflow pipe shall not be considered to be a tank vent. The vent shall be so designed and constructed as to prevent the entrance of birds or animals.

- d. Cleanout Doors: Two 24" x 46" flush cleanout doors (24" diameter shell manway) shall conform to the sizes and locations specified on the drawings.
- e. Tank Ladders: An outside OSHA ladder shall be furnished at the location designated. An interior ladder shall be supplied per NFPA22.
- f. Liquid Level Indicator: A liquid level indicator with float and target board shall be installed per NFPA 22.
- g. Internal Overflow Weir Cone: The internal overflow weir cone shall conform to NFPA 22.

K. Tank Foundation

- 1. The tank foundation shall be designed by the tank manufacturer to safely sustain the loads from the tank.
- 2. Steel Bottom Tanks: The foundation shall be installed per AWWA D103, Section 11.4. Supplying and installing these foundation materials shall included in the work of this section.
- 3. The foundation shall be level with differential not exceeding  $\pm 1/8$  inch in any 30-foot circumference under the shell. The levelness on the circumference shall not vary more than  $\pm 1/4$  inch from an established plane.

L. Tank Insulation

- 1. The insulation system shall meet all the requirements of NFPA 22.
- 2. Tank insulation shall be equal to NCFI Spray Foam System 362. The system shall be a two-part system designed to provide a minimum R-value of 7 per inch of insulation. The tank shall have a minimum of 2" of insulation or a minimum R-value of 14. The product shall be a closed cell foam for general purpose work.
- 3. Physical Properties

Core Density:	2.0 lbs. per cubic foot
Moisture Vapor Transmission:	2-3 perm in.
K Factor:	0.15
Compressive Strength:	28 psi
Flame Spread:	20
Smoke Developed:	Less than 450

- 4. The finished surfaces of sprayed polyurethane shall be protected from adverse effects of ultraviolet rays of direct sunlight. Insulation shall be protected with an elastomeric coating of acrylic or silicon which is compatible with the insulation.

M. Liquid Level Monitor

- 1. The level monitor shall utilize non-contacting ultrasonic technology to provide effective monitoring for a range up to 15 m (50 ft) on liquids. It shall include two alarm relays. The unit shall be wall-mounted and capable of volume calculation with 38 x 100 mm (1.5 x 4")

- multi-field backlit LCD display. The level monitor shall be equal to Milltronics Model MiniRanger Plus.
2. The transducer shall utilize a beam angle of 10° and a Hypalon rubber face for continuous level monitoring of water supply level. It shall be non-contacting with an effective measurement range from 0.3 to 10 m (1 to 33 ft). The unit shall be equal to Milltronics Model ST-H transducer.
  3. The system shall have alarm output for high water level, low water level and capable of monitoring water volume. The system shall include all components to perform these functions.

### PART 3 - EXECUTION

#### 3.1 STEEL, SURFACE WATER-STORAGE TANK INSTALLATION

- A. Erect tank shell, accessories, and appurtenances according to AWWA D100, AWWA M42 and NFPA 22.
- B. Fabricate tank sections and drill or punch bolt holes in the shop. Install bolts during field erection of tank.
- C. Set top of reinforced-concrete foundation at least 6 inches (150 mm) above finish grade.
- D. Install roof hatch near exterior ladder.
- E. Install roof manhole near center of roof.
- F. Install tank vent at center of roof.
- G. Install two manholes in tank wall near grade.

#### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect tanks to fire pump suction, tank heater, tank fill line, and altitude valve sensing line.
- C. Connect drains to storm-drainage piping.
- D. Ground equipment according to Division 16 Section "Grounding and Bonding."
- E. Connect wiring according to Division 16 Section "Conductors and Cables."
- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.3 SURFACE PREPARATION OF STEEL TANKS

- A. Field Cleaning: After erecting tank shell, remove burrs, dirt, and construction debris and repair damaged finishes.
- B. Field Surface Preparation: After field cleaning, prepare steel surfaces where factory-applied coating has been damaged, according to manufacturer's recommendations. Remove dust or residue from cleaned surfaces.
- C. If surface develops rust before prime coat is applied, repeat field surface preparation.

### 3.4 SURFACE WATER-STORAGE TANK APPURTENANCE INSTALLATION

- A. Install and adjust water-level control valves, piping, and alarms.
- B. Install cathodic protection according to Division 13 Section "Cathodic Protection" and AWWA D104.
- C. Install tank heaters according to NFPA 22.

### 3.5 FIELD QUALITY CONTROL

- A. Testing: Contractor shall engage a qualified testing agency to perform the following field quality-control testing:
  - 1. Leak Test: Comply with AWWA D100 and NFPA 22. Fill tanks with potable water and test for leaks after installation. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 3. Following completion of erection and cleaning of the tank, the tank shall be tested for liquid-tightness by filling the tank to its overflow elevation.
  - 4. Any leaks disclosed by this tank test shall be corrected by the Contractor in accordance with the tank manufacturer's recommendations.
  - 5. Clean water required for testing shall be furnished by Owner without charge at the time of erection completion. Filling and emptying the tank are also the responsibility of this Contractor.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

### 3.6 CLEANING

- A. Clean interior and exterior of surface water-storage tanks.
- B. Disinfect surface water-storage tanks according to requirements of authorities having jurisdiction.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the following. Refer to Division 1 Section "Closeout Procedures."
  - 1. Water-level controls.

3.8 SHIPPING

- A. All plates, supports, members, and miscellaneous parts shall be packaged for shipment in such manner to prevent abrasion or scratching of the finished coating.
- B. Erection

Field erection of factory-coated bolted steel tanks shall be in strict accordance with the tank manufacturer's recommendations. Particular care shall be exercised in handling and bolting of the tank plates, supports, and members to avoid abrasion or scratching of the coating. Touch-up coating shall be done in accordance with tank manufacturer's recommendations where and as directed.

3.11 WARRANTY

- A. The tank manufacturer shall warrant the tank against any defects in workmanship and materials for a period of one (1) year from the date of shipment. In the event any defect should appear, it shall be reported in writing to the manufacturer during the warranty period. Interior coating for potable water applications shall be warranted for 15 years.

3.12 TANK INSULATION PREPARATION

- A. All surfaces to be sprayed shall be clean, dry and free of dew, frost and moisture. All metal to which foam is to be applied shall be free of oil, grease, rust, etc. Primers shall be used where necessary in accordance with the manufacturer's requirements.

END OF SECTION 13220

## SECTION 13851 - FIRE SUPPRESSION CONTROL SYSTEM

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.
- B. Related Sections include the following:
  - 1. Division 8 Section “Hardware” for door: smoke detectors and devices that interface with fire alarm systems.

#### 1.3 DEFINITIONS

- A. FACP: Fire alarm control panel.
- B. LED: Light-emitting diode.
- C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

#### 1.4 SYSTEM DESCRIPTION

- A. General: Noncoded, non-addressable, zoned system with manual and automatic alarm initiation; and hard-wired for signal transmission, using separate individual circuits for each zone of alarm initiation and notification appliances. System shall utilize supervised, four-wire (class A) zoned wiring with non-proprietary generic type devices.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show details of graphic annunciator.
  - 1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
  - 2. Battery: Sizing calculations.
  - 3. Floor Plans: Indicate final outlet locations and routings of raceway connections

4. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- C. Operation Instructions: For mounting at the FACP.
- D. Product Certificates: Signed by manufacturer certifying that installers comply with requirements.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 13 and 72.
- G. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.
- H. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.
- I. Certificate of Completion: Comply with NFPA 72.
- J. All documents shall be submitted a minimum of 30 days prior to the expected scheduling of final ANG acceptance inspection/testing and commissioning.

#### 1.6 QUALITY ASSURANCE

- A. The Contractor (prime or sub) shall have on staff or under contract a qualified and experienced fire protection engineer. This person(s) shall be responsible for performing and overseeing all engineering aspects of the fire protection system construction, including but not limited to calculations, layout, shop drawings, equipment selection and inspections. This person shall also be responsible
- B. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.
- C. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

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- D. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.
- E. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
- F. Comply with NFPA 70, 72, 90A, and 101.
- G. All panels and devices shall be UL or FM listed for their intended application.

#### 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Strobe or Horn Strobe Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
  - 2. Smoke Detectors, Fire Detectors, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than one unit of each type.
  - 3. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than one unit of each type.
  - 4. Keys and Tools: One extra set for access to locked and tamperproofed components.

### PART 2 – PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following and shall be compatible with Signal Communications System:
  - 1. Signal Communication.
  - 2. Edwards Systems Technology; Unit of General Signal.
  - 3. Faraday, Inc.
  - 4. Federal Signal Corp.; Commercial Products Group.
  - 5. Gamewell Co. (The).
  - 6. Grinnell Fire Protection Systems.
  - 7. Honeywell, Inc.
  - 8. Notifier; Div. Of Pittway Corp.
  - 9. Simplex Time Recorder Co.
  - 10. Detector Electronics.

## 2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. There shall be two separate fire alarm system -- one for the Hangar Building and the other for the Fire Pump Building. See riser diagram on drawings.
- B. Control of System: By the FACP.
- C. System Supervision: Shall be Class "A" for wire system.
- D. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.
- E. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.
- F. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.
- G. Transmission to Remote Alarm Receiving Station: Automatically route emergency (eye wash), fire (detection, water flow, manual pull), tamper, supervisory, and trouble signals to a remote alarm receiving station by means of a radio alarm transmitter.
- H. This Contractor shall furnish and install a transmitter to perform these functions and shall be manufactured by Signal Communications. Coordinate exact type with the base system. Contractor shall perform programming and testing with an authorized Signal Communications personnel.
- I. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when an open circuit, ground or wire-to-wire short occurs, or an open circuit and a ground occur at the same time in an initiating device circuit, signal line circuit, or notification-appliance circuit.
- J. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.
- K. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a flame or heat detector, operation of a sprinkler flow device, or verified automatic alarm operation of a smoke detector initiates the following:
  - 1. Notification-appliance operation.

2. Identification at the FACP and the remote annunciator of the zone originating the alarm.
  3. Identification at the FACP and the remote annunciator of the device originating the alarm.
  4. Transmission of an alarm signal to the remote alarm receiving station.
  5. Shutdown of fans and other air-handling equipment serving zone when alarm was initiated.
  6. Recording of the event in the system memory and the remote annunciator.
- L. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP.
1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
  2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
  3. When alarm-indicating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.
- M. Waterflow alarm switch operation initiates the following:
1. Notification-appliance operation.
  2. Flashing of the device location-indicating light for the device that has operated.
- N. Smoke detection for zones or detectors with alarm verification initiates the following:
1. Audible and visible indication of an "alarm verification" signal at the FACP.
  2. Activation of a listed and approved "alarm verification" sequence at the FACP and the detector.
  3. Recording of the event by the system printer.
  4. General alarm if the alarm is verified.
  5. Cancellation of the FACP indication and system reset if the alarm is not verified.
- O. Sprinkler valve-tamper switch operation initiates the following:
1. A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
  2. Flashing of the device location-indicating light for the device that has operated.
  3. Recording of the event by the system printer.
  4. Transmission of supervisory signal to remote alarm receiving station.
- P. Fire-pump power failure, including a dead-phase or phase-reversal condition, initiates the following:
1. A supervisory, audible, and visible "fire-pump power failure" signal indication at the FACP.
  2. Transmission of trouble signal to remote alarm receiving station.

- Q. Removal of an alarm-initiating device or a notification appliance initiates the following:
  - 1. A “trouble” signal indication at the FACP and the annunciator for the device or zone involved.
  - 2. Transmission of trouble signal to remote alarm receiving station.
- R. 120V power input to FACP shall be provided with TVSS.

### 2.3 MANUAL PULLSTATIONS

- A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.
  - 1. Single-action mechanism initiates an alarm for building pullstations.
  - 2. Manual AFFF discharge stations shall be double-action mechanism requiring two actions (push and pull) to initiate an alarm. These stations shall be clearly identified for AFFF discharge and shall be different in shape than the building pullstations.
  - 3. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.

### 2.4 SMOKE DETECTORS

- A. General: Include the following features:
  - 1. Operating Voltage: 24V dc, nominal.
  - 2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  - 3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
  - 4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
  - 5. Sensitivity: Can be retested and adjusted in-place after installation.
- B. Photoelectric Smoke Detectors: Include the following features:
  - 1. Sensor: LED or infrared light source with matching silicon-cell receiver.
  - 2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
  - 3. Integral Thermal Detector: Fixed-temperature type with 135 deg F (58 deg C) setting.

- C. Ionization Detector: Include the following features:
  - 1. Responsive to both visible and invisible products of combustion.
  - 2. Self-compensating for changes in environmental conditions.
- D. Duct Smoke Detector: Photoelectric type.
  - 1. Sampling Tube: Design and dimensions as recommended by the manufacturer for the specific duct size, air velocity, and installation conditions where applied.
  - 2. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## 2.5 OTHER DETECTORS

- A. Heat Detector, Combination Type (all spaces excluding hangar bay): Actuated by a fixed temperature of 135 deg F (57 deg C), unless otherwise indicated.
  - 1. Mounting: Adapter plate for outlet box mounting.
  - 2. Mounting: Plug-in base, interchangeable with smoke detector bases.
- B. Heat Detector, Hangar Maintenance Bay Only: Detectors shall be cross-zoned, four-wire, supervised heat detection configuration. They shall be of rate compensated type with temperature range of 160-170 degrees F. Detectors shall be wired with a minimum of two zones with adjacent detectors on opposite zones. Fenwal Catalog No. 12-E27121-000-03 or equal.
- C. Flame Detector: Multi-spectrum infrared flame detector which looks for 3 different wave lengths of infrared. Shall be Detector Electronics Model #3300 or equal.
  - 1. Mounting: Adapter plate for outlet box mounting.
  - 2. Mounting: Plug-in base, interchangeable with smoke detector bases.

## 2.6 NOTIFICATION APPLIANCES

- A. Description: Equip for mounting as indicated and have screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
- B. Horns: Electric-vibrating-polarized type, 24V dc; with provision for housing the operating mechanism behind a grille. Horns product a sound-pressure level of 90 dB, measured 10 feet (3m) from the horn.
- C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch (25 mm) high letters on the lens.

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1. Rated Light Output: 15/75 candela in corridors and spaces 20' x 20' or less and 220 candela in spaces longer than 20' x 20'.
2. Strobe Leads: Factory connected to screw terminals.
3. Three or more strobes in the same area shall be synchronized.

## 2.7 CENTRAL FACP

- A. FACP shall be non-addressable, field expandable.
- B. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure is more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels. Panel shall be complete from the factory.
  1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1 inch (25 mm) high.
  2. Mounting: Surface.
- C. Alarm and Supervisory Systems: Construction requiring removal of field wiring for module replacement is unacceptable.
- D. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.
- E. Indicating Lights and System Controls: Individual LED devices identify zones transmitting signals. Zone lights distinguish between alarm and trouble signals, and indicate the type of device originating the signal. Manual switches and push-to-test buttons do not require a key to operate. Controls include the following:
  1. Alarm acknowledge switch.
  2. Alarm silence switch.
  3. System reset switch.
  4. LED test switch.
- F. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

## 2.8 REMOTE ANNUNCIATOR

- A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, reset, and test.
  1. Mounting: Flush cabinet, NEMA 250, Class 1.

- B. Display Type and Functional Performance: Individual LED for each type of alarm and supervisory device, and LEDs to indicate “normal power” and “trouble.”
  - 1. An alarm or supervisory signal causes the illumination of a zone light, floor light, and device light.
  - 2. System trouble causes the illumination of all lights above and also the trouble light.
  - 3. Additional LEDs indicate normal and emergency power modes for the system.
  - 4. A test switch tests LEDs mounted on the panel. Switch does not require key operation.

## 2.9 EMERGENCY POWER SUPPLY

- A. General: Components include sealed gel-cell maintenance free type battery, charger, and an automatic transfer switch. Battery shall be located in FACP and not in separate panel.
  - 1. Battery Nominal Life Expectancy: 5 years, minimum.
- B. Battery Capacity: Comply with NFPA 72.
- C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.
- D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.
- E. Battery shall be capable of maintaining the fire alarm operations for a minimum of 60 hours in the event of power outage.

## 2.10 RADIO ALARM TRANSMITTER

- A. Listed and labeled under NFPA 72 and NFPA 1221. Comply with 47 CFR 90.
- B. Description: Shall be by Signal Communication; factory assembled, wired, and tested; and ready for installation and operation. Coordinate exact type and model with the base.
  - 1. Packaging: A single, modular, NEMA 250, Type 1 metal enclosure with a tamper-resistant flush tumbler lock.
  - 2. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of the established remote alarm receiving station designated by Government.
  - 3. Normal Power Input: 120-V ac.

4. Secondary Power: Integral-sealed, rechargeable, 12-V battery and charger. Comply with NFPA 72 requirements for battery capacity.
  5. Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports shall withstand 100 mph (160 km/h) with a gust factor of 1.3 without failure.
  6. Antenna Cable: Coaxial cable with impedance matched to the transmitter output impedance.
  7. Antenna-Cable Connectors: Weatherproof.
  8. Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to the transmitter, matching fire alarm and other system outputs to message generating inputs of the transmitter that produce required message transmissions.
- C. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, or from its own internal sensors or controls, and automatically transmits signal along with a unique code that identifies the transmitting station to the remote alarm receiving station. The message transmitted corresponds to standard designations for the fire-reporting system to which the signal is being transmitted and includes separately designated messages in response to the following events or conditions.
1. Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.
  2. System Test Message: Initiated by a manual test switch within the transmitter cabinet or automatically, at an optionally preselected time, once every 24 hours with transmission time controlled by a programmed timing device integral to transmitter controls.
  3. Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, or the transmitter normal power source or derangement of the wiring of the transmitter or any alarm input interface circuit or device connected to it.
  4. Local Fire Alarm System Trouble Message: Initiated by events or conditions that cause a trouble signal to be indicated on the building system.
  5. Local Fire Alarm System Alarm Message: Actuated when the building system goes into an alarm state. Identified zone or device that initiated the alarm.
  6. Local Alarm System Supervisory Alarm Message: Actuated when the building alarm system indicates a supervisory alarm.

## 2.11 GUARDS FOR PHYSICAL PROTECTION

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
1. Factory fabricated and furnished by the manufacturer of the device.
  2. Finish: Paint of color to match the protected device.

## 2.12 WIRE

- A. All Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
  - 1. See fire alarm riser diagram.

## PART 3 – EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. Manual Pull Stations: Mount semiflush in recessed back boxes, or surface mount depending on application.
- B. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.
- C. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.
- D. Smoke Detectors Near Air Registers: Install no closer than 60 inches (1520 mm).
- E. Duct Smoke Detectors: Comply with manufacturer's written instructions.
  - 1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 2. Install sampling tubes so they extend the full width of the duct.
- F. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling and in accordance with ADA requirements. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.
- G. Visible Alarm-Indicating Devices: Install at least 6 inches (150 mm) below the ceiling.
- H. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- I. Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- J. Annunciator: Install with the top of the panel not more than 72 inches (1830 mm) above the finished floor.

- K. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that will resist 100 mph (160-km/h) wind load with a 1.3 gust factor without damage.

### 3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in EMT according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be ¾". Alarm and supervisory wiring shall be in separate conduits. Use of FMC or LiquidLite is not permitted. Wiring shall be per schedule on drawings.
- B. Wiring Within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- D. Color-Coding: Color-code for the fire alarm conductors shall be black and red with red jacket and shall differ from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- E. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
- F. Wiring to Remote Alarm Transmitting Device: 1-inch (25 mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.
- G. Wiring shall be four wire (Class A).

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Basic Electrical Materials and Methods."