

PROJECT SPECIFICATION MANUAL

VOLUME 1 OF 3



EVANSTON ANIMAL SHELTER

2310 OAKTON STREET
EVANSTON, IL 60202

ISSUE FOR BID / PERMIT

December 8, 2022

DESIGN TEAM:

HOLABIRD & ROOT

Architect / Interior Design

CONNOLLY

Architect / Consultant

TERRA ENGINEERING LTD.

Civil Engineering & Surveying

RME

Structural Engineering

SITE DESIGN GROUP

Landscape Architecture

IMEG CORP.

MEP/FP Engineering

CCS INTERNATIONAL

Cost Estimating

GSG

CONSULTANTS

Geotechnical &
Environmental Engineering

TABLE OF CONTENTS TOC - 1

EVANSTON ANIMAL SHELTER

The following listed documents comprise the project manual for the project listed above. Where numerical sequence of sections is interrupted, such interruptions are intentional.

The complete Project Manual for this project consists of these entire Volumes 1, 2 and 3, which must not be separated for any reason. The Architect and Owner disclaim any responsibility for any assumptions made by a contractor or subcontractor who does not receive a complete Project Manual, including all sections listed in the Table of Contents.

TABLE OF CONTENTS	Design Firm	Issue Date
<u>VOLUME 1</u>		
<u>DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS</u>		
00 0010 Table of Contents	H&R	12/08/22
<u>DIVISION 01 - GENERAL REQUIREMENTS</u>		
01 0000 Project Requirements	H&R	12/08/22
01 0100 Summary of Work	H&R	12/08/22
01 0270 Applications for Payment	H&R	12/08/22
01 0280 Change Order Procedure	H&R	12/08/22
01 0450 Cutting and Patching	H&R	12/08/22
01 0510 Grades, Lines and Levels	H&R	12/08/22
01 0600 Regulatory Requirements	H&R	12/08/22
01 0950 Referenced Standards and Definitions	H&R	12/08/22
01 1050 Existing Utility Procedures	H&R	12/08/22
01 2000 Project Meetings	H&R	12/08/22
01 2100 Allowances	H&R	12/08/22
01 2300 Alternates	H&R	12/08/22
01 2700 Unit Prices	H&R	12/08/22
01 3000 Submittals	H&R	12/08/22
01 3562 Erosion and Sedimentation Control	TE	12/08/22
01 4000 Quality Control Services	H&R	12/08/22
01 5000 Temporary Facilities	H&R	12/08/22
01 5600 Temporary Environmental Controls	H&R	12/08/22
01 5639 Temporary Tree and Plant Protection	SDG	12/08/22
01 6000 Materials and Equipment	H&R	12/08/22
01 6300 Substitutions and Product Options	H&R	12/08/22
01 7000 Project Closeout	H&R	12/08/22

01 7100	Cleaning	H&R	12/08/22
01 7200	Project Record Documents	H&R	12/08/22
01 7300	Operating and Maintenance Data	H&R	12/08/22
01 7400	Warranties and Bonds	H&R	12/08/22
01 7419	Construction Waste Management and Disposal	H&R	12/08/22
01 8113	Sustainable Design Requirements – LEED v4 BD+C	H&R	12/08/22
01 9113	General Commissioning Requirements	dbHMS	12/08/22

DIVISION 02 – EXISTING CONDITIONS

02 4113	Site Demolition	TE	12/08/22
02 4116	Structure Demolition	H&R	12/08/22

DIVISION 03 - CONCRETE

03 3000	Cast-In-Place Concrete	RME	12/08/22
03 3543	Polished Concrete Finishing	H&R	12/08/22

DIVISION 04 - MASONRY

04 2000	Unit Masonry	H&R	12/08/22
04 4100	Dry-Placed Stone	SDG	12/08/22

DIVISION 05 - METALS

05 1200	Structural Steel Framing	RME	12/08/22
05 2100	Steel Joist Framing	RME	12/08/22
05 3100	Steel Decking	RME	12/08/22
05 5000	Metal Fabrications	H&R, SDG	12/08/22

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

06 1053	Miscellaneous Rough Carpentry	H&R	12/08/22
06 1600	Sheathing	H&R	12/08/22
06 1800	Glued-Laminated Construction	RME	12/08/22
06 2013	Exterior Finish Carpentry	SDG	12/08/22
06 4116	Plastic-Laminate-Clad Architectural Cabinets	H&R	12/08/22
06 6400	Plastic Paneling	H&R	12/08/22

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 2100	Thermal Insulation	H&R	12/08/22
07 2119	Foamed-In-Place Insulation	H&R	12/08/22
07 2616	Below Slab Vapor Barriers	H&R	12/08/22
07 2726	Fluid Applied Membrane Air Barriers	H&R	12/08/22
07 4213	Formed Metal Wall Panels	H&R	12/08/22
07 5423	Thermoplastic-Polyolefin (TPO) Roofing	H&R	12/08/22
07 6200	Sheet Metal Flashing and Trim	H&R	12/08/22
07 7100	Roof Specialties	H&R	12/08/22

07 7200	Roof Accessories	H&R	12/08/22
07 8413	Penetration Firestopping	H&R	12/08/22
07 9200	Joint Sealants	H&R	12/08/22
07 9219	Acoustical Joint Sealants	H&R	12/08/22

DIVISION 08 - OPENINGS

08 1113	Hollow Metal Doors and Frames	H&R	12/08/22
08 1216	Aluminum Frames	H&R	12/08/22
08 1416	Flush Wood Doors	H&R	12/08/22
08 3113	Access Doors and Frames	H&R	12/08/22
08 3213	Sliding Aluminum-Framed Glass Doors	H&R	12/08/22
08 4213	Aluminum-Framed Entrances and Storefronts	H&R	12/08/22
08 7100	Door Hardware	H&R	12/08/22
08 7113	Automatic Door Operators	H&R	12/08/22
08 8000	Glazing	H&R	12/08/22

DIVISION 09 – FINISHES

09 2216	Non-Structural Metal Framing	H&R	12/08/22
09 2900	Gypsum Board	H&R	12/08/22
09 5113	Acoustical Panel Ceilings	H&R	12/08/22
09 6513	Resilient Base and Accessories	H&R	12/08/22
09 9113	Exterior Painting	H&R	12/08/22
09 9123	Interior Painting	H&R	12/08/22
09 9600.01	High Performance Coating Systems (Landscape)	SDG	12/08/22

DIVISION 10 - SPECIALTIES

10 1100	Visual Display Units	H&R	12/08/22
10 1419	Dimensional Letter Signage	H&R	12/08/22
10 1423	Panel Signage	H&R	12/08/22
10 2116	Solid Surface Shower and Dressing Compartments	H&R	12/08/22
10 2600	Wall and Door Protection	H&R	12/08/22
10 2800	Toilet, Bath, and Laundry Accessories	H&R	12/08/22
10 4413	Fire Protection Cabinets	H&R	12/08/22
10 4416	Fire Extinguishers	H&R	12/08/22
10 5113	Metal Lockers	H&R	12/08/22
10 5613	Metal Storage Shelving	H&R	12/08/22
10 8213	Roof Screens	H&R	12/08/22

DIVISION 11 - EQUIPMENT

11 7000	Medical Equipment	Connolly	12/08/22
---------	-------------------	----------	----------

DIVISION 12 - FURNISHINGS

12 2413	Roller Window Shades	H&R	12/08/22
---------	----------------------	-----	----------

12 3570	Healthcare Casework	H&R	12/08/22
12 3616	Metal Countertops	H&R	12/08/22
12 3661.16	Solid Surfacing Countertops	H&R	12/08/22
12 4813	Entrance Floor Mats and Frames	H&R	12/08/22
12 9300	Site Furnishings	SDG	12/08/22

DIVISION 13 – SPECIAL CONSTRUCTION

13 1913	Kennel Enclosures and Gates	Connolly	12/08/22
13 1920	Cages	Connolly	12/08/22

VOLUME 2

DIVISION 21 - FIRE SUPPRESSION

21 0500	Basic Fire Suppression Requirements	IMEG	12/08/22
21 0503	Through Penetration Firestopping	IMEG	12/08/22
21 0529	Fire Suppression Supports and Anchors	IMEG	12/08/22
21 0553	Fire Suppression Identification	IMEG	12/08/22
21 1302	Fire Protection Systems	IMEG	12/08/22

DIVISION 22 – PLUMBING

22 0500	Basic Plumbing Requirements	IMEG	12/08/22
22 0529	Plumbing Supports and Anchors	IMEG	12/08/22
22 0553	Plumbing Identification	IMEG	12/08/22
22 0719	Plumbing Piping Insulation	IMEG	12/08/22
22 0800	Commissioning of Plumbing	dbHMS	12/08/22
22 0900	Instrumentation	IMEG	12/08/22
22 1000	Plumbing Piping	IMEG	12/08/22
22 1030	Plumbing Specialties	IMEG	12/08/22
22 1123	Domestic Water Pumps	IMEG	12/08/22
22 3000	Plumbing Equipment	IMEG	12/08/22
22 4000	Plumbing Fixtures	IMEG	12/08/22

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

23 0500	Basic HVAC Requirements	IMEG	12/08/22
23 0529	HVAC Supports and Anchors	IMEG	12/08/22
23 0553	HVAC Identification	IMEG	12/08/22
23 0593	Testing, Adjusting, and Balancing	IMEG	12/08/22
23 0713	Ductwork Insulation	IMEG	12/08/22
23 0800	Commissioning of HVAC	dbHMS	12/08/22
23 0900	Controls	IMEG	12/08/22
23 3100	Ductwork	IMEG	12/08/22
23 3300	Ductwork Accessories	IMEG	12/08/22
23 3423	Power Ventilators	IMEG	12/08/22

23 3600	Air Terminal Units	IMEG	12/08/22
23 3700	Air Inlets and Outlets	IMEG	12/08/22
23 7416.12	Packaged Rooftop Air Conditioning Units 25 Ton and Below	IMEG	12/08/22
23 8126	Split System Air Conditioning Units	IMEG	12/08/22
23 8200	Terminal Heat Transfer Units	IMEG	12/08/22

DIVISION 26 – ELECTRICAL

26 0500	Basic Electrical Requirements	IMEG	12/08/22
26 0503	Through Penetration Firestopping	IMEG	12/08/22
26 0513	Wire and Cable	IMEG	12/08/22
26 0526	Grounding and Bonding	IMEG	12/08/22
26 0527	Supporting Devices	IMEG	12/08/22
26 0533	Conduit and Boxes	IMEG	12/08/22
26 0553	Electrical Identification	IMEG	12/08/22
26 0800	Commissioning of Electrical	dbHMS	12/08/22
26 0913	Power Monitoring and Control System	IMEG	12/08/22
26 0933	Lighting Control Systems	IMEG	12/08/22
26 2000	Service Entrance	IMEG	12/08/22
26 2413	Switchboards	IMEG	12/08/22
26 2416	Panelboards	IMEG	12/08/22
26 2419	Motor Control	IMEG	12/08/22
26 2726	Wiring Devices	IMEG	12/08/22
26 2816	Disconnect Switches	IMEG	12/08/22
26 4300	Surge Protection Devices	IMEG	12/08/22
26 5119	LED Lighting	IMEG	12/08/22
26 5215	Emergency Lighting Inverter	IMEG	12/08/22

DIVISION 27 – COMMUNICATIONS

27 0500	Basic Communications Systems Requirements	IMEG	12/08/22
27 0503	Through Penetration Firestopping	IMEG	12/08/22
27 0526	Communications Bonding	IMEG	12/08/22
27 0528	Interior Communication Pathways	IMEG	12/08/22
27 0543	Exterior Communication Pathways	IMEG	12/08/22
27 0553	Identification and Administration	IMEG	12/08/22
27 1100	Communication Equipment Rooms (CER)	IMEG	12/08/22
27 1343.53	Television Distribution System	IMEG	12/08/22
27 1500	Horizontal Cabling Requirements	IMEG	12/08/22
27 1710	Testing	IMEG	12/08/22
27 1720	Structured Cabling System Warranty	IMEG	12/08/22
27 4100	Professional Audio/Video System	IMEG	12/08/22

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 0500	Basic Electronic Safety and Security System Requirements	IMEG	12/08/22
28 0503	Through Penetration Firestopping	IMEG	12/08/22
28 1300	Electronic Access Control	IMEG	12/08/22
28 2300	Video Surveillance	IMEG	12/08/22
28 3100	Fire Alarm and Detection Systems	IMEG	12/08/22

DIVISION 31 – EARTHWORK

31 2114	Earthwork for Sitework	TE	12/08/22
31 2317	Excavating, Backfilling, and Compacting for Utilities	TE	12/08/22
31 3219	Geosynthetic Soil Stabilization and Layer Separation	SDG	12/08/22

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 1216	Hot Mix Asphalt Paving	TE	12/08/22
32 1313	Portland Cement Concrete Paving	TE	12/08/22
32 1314	Artificial Turf	SDG	12/08/22
32 1373	Concrete Paving Joint Sealants	SDG	12/08/22
32 1400	Unit Paving	SDG	12/08/22
32 1543	Stabilized Aggregate Paving	SDG	12/08/22
32 1550	Metal Edging	SDG	12/08/22
32 3119	Metal Fences	SDG	12/08/22
32 8400	Planting Irrigation	SDG	12/08/22
32 9113	Soil Preparation	SDG	12/08/22
32 9200	Turf and Grasses	SDG	12/08/22
32 9300	Plants	SDG	12/08/22

DIVISION 33 - UTILITIES

33 1013	Water Service	TE	12/08/22
33 4100	Sewerage and Drainage	TE	12/08/22
33 4600	Subdrainage	SDG	12/08/22

VOLUME 3

APPENDICES:

01	Geotechnical Report by GSG Consultants, Inc.	GSG	12/08/22
02	Phase II Environmental Site Assessment Report	GSG	12/08/22
03	Supplemental Site Investigation – Lead Delineation	GSG	12/08/22
04	Soil Management & Remediation Plan Recommendations	GSG	12/08/22
05	Limited Hazardous Building Materials Survey Report	GSG	12/08/22

END OF TABLE OF CONTENTS

SECTION 01 00 00 – PROJECT REQUIREMENTS

PART 1 – GENERAL

1.01 GENERAL NOTE

- A. The following requirements are a component part of all contract divisions and form a part of each specification section in so far as they may be in any way applicable thereto.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this section.

1.03 SCHEDULE OF DRAWINGS

- A. The following drawings form a component part of all contract documents for this project.

Title of the Drawings:

<u>Sheet No.</u>	<u>Drawing Title</u>
------------------	----------------------

G0-0	GENERAL INFORMATION & DRAWING INDEX
G1-1	CODE INFORMATION
G1-2	CODE INFORMATION
G1-3	LIFE SAFETY PLAN
G1-4	LEED SCORECARD, CURRENT PROGRAM & ALTERNATE LIST

CIVIL

1 OF 1	CIVIL SURVEY (FOR REFERENCE)
C001	GENERAL NOTES
C002	EXISTING CONDITIONS
C100	SITE DEMOLITION PLAN
C200	SITE DIMENSION PLAN
C300	SITE GRADING PLAN
C301	SITE EROSION CONTROL PLAN
C302	SITE EROSION CONTROL DETAILS
C400	SITE UTILITY PLAN
C401	SITE UTILITY PROFILES
C500	DETAILS
C501	DETAILS
C502	DETAILS

ARCHITECTURAL SITE

AS1-0	ARCHITECTURAL SITE DEMOLITION PLAN
AS1-1	ARCHITECTURAL SITE PLAN

LANDSCAPING

L-002	OVERALL SITE PLAN (FOR REFERENCE ONLY)
L-003	GENERAL NOTES, SYMBOLS AND ABBREVIATIONS
L-008	TREE PRESERVATION AND REMOVAL PLAN
L-101	LANDSCAPE SITE PLAN
L-103	HARDSCAPE PLAN
L-104	SITE FURNISHINGS PLAN
L-105	SOILS PLAN
L-106	PLANTING PLAN
L-201	LANDSCAPE SITE ELEVATION
L-301	LANDSCAPE SITE SECTION
L-501	PRESERVATION DETAILS

L-503	HARDSCAPE DETAILS
L-504	SITE FURNISHING DETAILS
L-504A	SITE FURNISHING DETAILS
L-504B	SITE FURNISHING DETAILS
L-506	PLANTING DETAILS
L-603	HARDSCAPE SCHEDULE
L-604	SITE FURNISHINGS SCHEDULE
L-606	PLANTING SCHEDULE
LI-000	AREAS TO BE IRRIGATED PLAN

ARCHITECTURAL

A1-1	ARCHITECTURAL SYMBOLS & ABBREVIATIONS
A2-1	FLOOR PLAN
A2-2	DIMENSION PLAN
A2-3	ROOF PLAN & DETAILS
A3-1	REFLECTED CEILING PLAN
A4-1	BUILDING ELEVATIONS
A4-2	BUILDING SECTIONS
A4-3	BUILDING AXONS
A5-1	ENLARGED ELEVATIONS & SECTIONS
A5-2	ENLARGED ELEVATIONS & SECTIONS
A5-3	ENLARGED ELEVATIONS & EXTERIOR DETAILS
A5-4	ENLARGED ELEVATIONS & EXTERIOR DETAILS
A5-5	EXTERIOR DETAILS
A5-6	EXTERIOR DETAILS - WALL ASSEMBLIES
A5-7	EXTERIOR DETAILS - WALL ASSEMBLIES
A5-8	EXTERIOR DETAILS – BRICK PATTERN
A6-1	TYPICAL PLANS, ELEVATIONS & DETAILS
A6-2	ENLARGED PLANS & INTERIOR ELEVATIONS - RESTROOMS
A7-1	PARTITION TYPES & DETAILS
A7-2	DOOR SCHEDULE, ELEVATIONS AND DETAILS
A8-1	ENLARGED INTERIOR PLANS & ELEVATIONS
A8-2	ENLARGED INTERIOR PLANS & ELEVATIONS
A8-3	ENLARGED INTERIOR PLANS & ELEVATIONS
A8-5	MILLWORK DETAILS
A9-1	INTERIOR DETAILS
A9-2	INTERIOR DETAILS – LOBBY RECEPTION COUNTER

INTERIORS

ID2-1	INTERIOR FINISH SCHEDULE & PLAN
FF&E	
FFE2-1	EQUIPMENT SCHEDULE & PLAN

STRUCTURAL

S0.1	GENERAL NOTES
S0.2	GENERAL NOTES AND SYMBOLS
S0.3	SPECIAL INSPECTIONS AND TESTS
S1.0	FOUNDATION PLAN
S1.1	UPPER ROOF LEVEL
S3.1	TYPICAL DETAILS - CONCRETE
S3.2	CONCRETE SECTIONS AND DETAILS
S3.3	CONCRETE SECTIONS AND DETAILS
S4.1	SECTIONS AND DETAILS

S4.2 JOIST SCHEDULE AND BASE PLATE DETAILS
S4.3 COLD FORMED METAL FRAMING DETAILS

MECHANICAL

M0-0 MECHANICAL COVERSHEET
M1-1 FIRST FLOOR - MECHANICAL
M1-2 ROOF - MECHANICAL
M5-0 MECHANICAL DETAILS
M5-1 MECHANICAL DETAILS
M6-0 MECHANICAL CONTROL DIAGRAMS
M6-1 MECHANICAL CONTROL DIAGRAMS
M6-2 MECHANICAL CONTROL DIAGRAMS
M6-3 MECHANICAL CONTROL DIAGRAMS
M7-0 MECHANICAL SCHEDULES
M7-1 MECHANICAL SCHEDULES

PLUMBING

P0-0 PLUMBING COVERSHEET
P1-0 UNDERFLOOR - PLUMBING
P1-1 FIRST FLOOR - PLUMBING
P1-2 ROOF - PLUMBING
P4-0 PLUMBING ENLARGED PLANS
P5-0 PLUMBING DETAILS
P5-1 PLUMBING DETAILS
P7-0 PLUMBING MATERIAL LISTS

FIRE PROTECTION

F0-0 FIRE PROTECTION COVERSHEET
F1-1 FIRST FLOOR - FIRE PROTECTION
F5-0 FIRE PROTECTION DETAILS

ELECTRICAL

E0-0 ELECTRICAL COVERSHEET
E0-1 SITE PLAN – ELECTRICAL
E0-2 SITE PLAN PHOTOMETRICS - ELECTRICAL
E1-1 FIRST FLOOR - LIGHTING
E2-1 FIRST FLOOR - POWER
E2-2 ROOF - ELECTRICAL
E3-1 FIRST FLOOR - SYSTEMS
E5-0 ELECTRICAL DETAILS
E6-0 ELECTRICAL DIAGRAMS
E7-0 ELECTRICAL SCHEDULES
E7-1 ELECTRICAL SCHEDULES

TECHNOLOGY

T0-0 TECHNOLOGY COVERSHEET
T1-0 SITE PLAN - TECHNOLOGY
T1-1 FIRST FLOOR - TECHNOLOGY
T2-0 TECHNOLOGY ROOM ENLARGEMENTS
T3-0 TECHNOLOGY DETAILS
T4-0 TECHNOLOGY DETAILS
T5-0 TECHNOLOGY DIAGRAMS
T6-0 TECHNOLOGY SCHEDULES

1.04 PROJECT SUMMARY

- A. Work on this project includes, but is not limited to demolishing the existing Animal Shelter, site preparation, constructing a new single story, approx. 8850 SF Animal Shelter Facility for the City of Evanston and associated site improvements.
- 1.05 SPECIAL PROCEDURES AND REQUIREMENTS
- A. Fire Protection
1. Regulations: The Contractor shall comply with all federal, state and local fire regulations.
 2. Fires: The Contractor shall prohibit the lighting of fires about the premises and use due diligence to see that such prohibition is enforced. Debris and waste materials shall not be burned at the construction site but shall be promptly removed to prevent the accumulation of combustibles on the site.
 3. Smoking: Smoking shall be restricted to designated exterior locations. The Contractor shall furnish and post "NO SMOKING" signs at appropriate locations throughout the site where operations are conducted.
 4. Flammables: Gasoline and other fuels shall be kept and handled from National Board of Fire underwriter's approved safety cans and shall be stored away from hazardous work areas.
- B. Limit of Contractor's Operations
1. Work Areas: Work areas shall be confined to the limits of the construction site. The allotment of work areas within the site to Subcontractors shall be made by the Contractor. The general scheme of operations, work area assignments and use of the job site shall be subject to the Owner's approval.
 2. Site Access: Uncontrolled or unrestricted site access will not be permitted for materials, debris or equipment. All access routes and methods shall be controlled by the Contractor so as to minimize the disruption of the Owner's operations and shall be subject to approval by the Owner. Walks, roads and other existing site features used in moving materials shall be properly protected to prevent damage thereto.
- C. Hoists, Scaffolds and Ladders
1. Hoists: The Contractor shall furnish, erect, operate and maintain suitable hoisting equipment as may be necessary for constructing the work. Material hoists shall be constructed and maintained in accordance with all applicable federal, state and local laws, regulations and ordinances. Location of hoists shall be subject to approval by the Owner's representative.
 2. Scaffolds and Ladders: The Contractor shall furnish, erect, maintain and move all scaffold and ladders required for his work. Scaffolds shall be constructed and maintained in accordance with all applicable federal, state and local laws, regulations and ordinances. Scaffolds and ladders shall be promptly removed after their purpose has been served.
- D. Documentation of Existing Conditions
1. Before starting any work, the Contractor shall examine the site to be worked on and the grounds in the staging area and areas adjacent to the site that will be worked on for any existing damage. The Contractor should notify the City's representative of any damage found immediately. The City will photograph and note any existing damage that has been brought to his attention by the Contractor. After the Work has been completed the City will inspect the area used by the Contractor. If any damage is found that was not reported previously, this damage would be considered to have been done by the Contractor. The cost to repair said damage shall be solely borne by the Contractor.
- 1.06 TEMPORARY CONSTRUCTION FACILITIES
- A. The following temporary utilities and facilities on the construction site shall be provided by the party indicated below:

<u>ITEM</u>	<u>PROVIDER</u>
Telephone	General Contractor
Electricity	Owner
Water	Owner
Toilets	General Contractor
Parking spaces for Contractor vehicles	Within job site only, no street parking
Parking spaces for workmen	Within job site only, no street parking
Storage areas & facilities	Limited unsecured space within job site
Temporary heat	General Contractor
Job-site trailers & offices	General Contractor

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 00 00

SECTION 01 01 00 – SUMMARY OF WORK

PART 1 – GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project Manual and accompanying drawings are intended to cover the work necessary to construct the various headings of work as described in detail herein.
- B. The work to be performed under this contract shall consist of the furnishing of all materials, equipment, supplies, labor and transportation, and performing all work as required to strictly conform to the provisions of the specifications, schedules and drawings, all of which are made a part herein, together with such detail drawings as may be furnished by the Owner from time to time during the prosecution of the work in amplification of said drawings and specifications. This includes:
Demolishing the existing Animal Shelter, site preparation, constructing a new single story, 8850 SF Animal Shelter Facility for the City of Evanston and associated site improvements.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this section.

1.03 CONTRACT ORGANIZATION

- A. This Construction Project is organized under a single contract between the Owner and the Contractor. The Contractor is responsible for all plans and specification sections as presented in this project manual.

1.04 WORK SEQUENCE

- A. All work must be complete, including start-up and commissioning prior to November 30, 2023. This is the substantial completion deadline.
- B. Final completion of the construction project will be attained when all items from the final inspection report, prepared in conjunction with the designing engineer and the City of Evanston, are completed to the satisfaction of the City of Evanston.
- C. The final completion deadline is March 29, 2024.
- D. All work and sequence of operations shall be as scheduled in conjunction with all subcontractors, and the Owner in such a manner as not to hinder or delay any other contractors in the progress of their work, and to an end that will expedite the work to completion at the earliest possible date.
- E. Both Contractor and Subcontractor shall cooperate to execute their work as scheduled to minimize the delays to each other and to cause the least inconvenience to the Owner and the public.

1.05 CONTRACTORS' USE OF PREMISES

- A. The Contract shall limit his use of the premises for work and for storage to allow for:
 - 1. Work by other contractors
 - 2. Owner occupancy
 - 3. Public use
- B. Coordinate the use of the premises under direction of the Owner. Stage work so as to avoid disruption to Owner's operation.
- C. Assume full responsibility for the protection and safekeeping of products under this Contract, which are stored at the project site or on the Contractor's property.
- D. Move any stored products, under Contractor's control, which interfere with operation of the Owner or separate contractor.
- E. Obtain and pay for the use of additional storage or work areas needed for operations.

1.06 OWNER OCCUPANCY

- A. Owner will not occupy the area within the construction fencing during construction.

- B. The City and the public will maintain 24 hour access to all areas of the property outside of the construction fencing at all times.
 - C. Contractor shall not utilize or prevent access to existing utility easement areas during the entire construction period.
- 1.07 LINES, LEVELS AND LAYOUT OF WORK
- A. The Contractor shall establish and guarantee all lines, levels, etc. called for on the drawings, including the lines, levels, etc. of all Subcontractors.
- 1.08 DESCRIPTION OF STRUCTURE
- A. The work will take place at the Evanston Animal Shelter Facility.
- 1.09 WORK HOURS
- A. Work hours are 7:00 am to 7:00 pm, Monday through Friday and 8:00 am to 5:00 pm on Saturday. No work is allowed on Sundays. Access to the site will not be allowed outside of normal work hours.
- 1.10 CONTRACTOR'S DUTIES
- A. Except as specifically noted, provide and pay for:
 - 1. Labor, materials and equipment.
 - 2. Tools, construction equipment and machinery
 - 3. Water, heat, and utilities required for construction or the Contractor's operations.
 - 4. Other facilities and services necessary for proper execution and completion of work, including traffic control and temporary work.
 - B. Promptly submit written notice to the Architect of any observed variance of the Contract Documents from legal requirements. It is not the Contractor's responsibility to make certain that the Drawings and Specifications comply with codes and regulations.
 - 1. Appropriate modifications to the Contract Documents will adjust the necessary changes.
 - 2. The Contractor shall assume responsibility for work known to be contrary to such requirements, and performed without such notice.
 - C. Enforce strict discipline and good order among employees. Do not employ on work:
 - 1. Unfit persons
 - 2. Persons not skilled in assigned task
 - D. Existing Conditions
 - 1. The Contractor shall be responsible for obtaining and verifying all dimensions. Any dimension given in the Drawings referring to existing construction were taken from the original construction documents and are provided for information only.
 - 2. Where conditions are uncovered that are not anticipated by the Drawings and Specifications, the Contractor shall notify the Engineer and Owner's Representative immediately, before any modification or other work is initiated.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 01 00

SECTION 01 02 70 – APPLICATIONS FOR PAYMENT

PART 1 – GENERAL

1.01 SUMMARY

- A. Contractor shall comply with procedures described in this Section when applying for progress payments and final payment under the Contract.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.
- B. Payments upon Substantial Completion and Completion of the Work are described in Section 01 70 00 – PROJECT CLOSEOUT.
- C. The Owner’s approval of applications for progress payment and final payment may be contingent upon the Owner’s approval of status of Project Record Documents as described in Section 01 72 00 – PROJECT RECORD DOCUMENTS of these Specifications.

1.03 QUALITY ASSURANCE

- A. Prior to start of construction, secure the Owner’s approval of the schedule of values required to be submitted as specified below.
- B. During progress of the Work, modify the schedule of values as approved by the Owner to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract.
- C. All requests for payment shall be based on the approved Schedule of Values for the project.
- D. All modifications to the contract shall be based on the approved Schedule of Values for the project.

1.04 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of the Contractor’s Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 - a. Contractor’s construction schedule.
 - b. Application for Payment forms.
 - c. List of subcontractors.
 - d. Schedule of alternates.
 - e. List of products.
 - f. List of principal suppliers and fabricators.
 - g. Schedule of submittals.
 - 2. Submit the Schedule of Values to the Owner at the earliest feasible date, but in no case later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.
- B. If applicable, the format and content of the Schedule of Values shall match the project’s unit pricing. The Contractor is strongly encouraged to utilize spreadsheet software for preparation of all pay applications.
 - 1. Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Purchase order number.
 - c. Contractor’s name and address.
 - d. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Itemized description.
 - b. Related Specification Section
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.

- e. Name of supplier.
 - f. Change Orders (numbers) that have affected value.
 - g. Dollar value.
 - h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
3. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 4. Show line items for indirect costs and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
 5. Update and resubmit the Schedule of Values when Change Orders result in a change in the Contract Sum.

1.05 PROCEDURES

A. Informal submittal

1. Make informal submittal of request for payment by filling in, with erasable pencil, pertinent portions of AIA Document G702, "Application and Certification for Payment," plus continuation sheet or sheets of AIA Document G703.
2. Make this preliminary submittal to the Architect and Owner in accordance with the Owner's payment schedule.
3. Revise the informal submittal of the request for payment as directed by the Owner, initialing all copies.

B. Formal submittal

1. Make formal submittal of request for payment by filling in the agreed data, by typewriter or neat lettering in ink, on AIA Document G702, "Application and Certification for Payment," plus continuation sheet(s) of AIA Document G703.
2. Sign and notarize the Application and Certificate for Payment.
3. Reference Purchase Order number on Application for Payment
4. Secure and file with submittal progress waivers for all materials incorporated into and labor and equipment employed on the work before payment requests are processed.
 - a. Initial payment will be processed without progress waivers. Subsequent requests will require progress waivers for previous payment.
5. Submit the request for payment via email to the owner's project manager with a copy to the project manager from the Architect if applicable.
6. The Architect and Owner will compare the formal submittal with the approved informal submittal and, when approved, will sign the Application and Certificate for Payment, will make and distribute required copies. The Owner will disburse directly to the Contractor the amount certified less 10% retainage.
7. Approved formal submittals must be received by the Owner in accordance with the Owner's payment schedule.
8. Certified payroll records must be submitted along with the formal submittal as described in the General Conditions.
9. Certified payroll records must be concurrently submitted to the Illinois Department of Labor using the Certified Transcript of Payroll Portal.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION

City of Evanston
Evanston Animal Shelter
Holabird & Root, LLC Project No. 16015

Issue for Bid / Permit
12/08/2022

(NOT APPLICABLE)

END OF SECTION 01 02 70

SECTION 01 02 80 – CHANGE ORDER PROCEDURE

PART 1 GENERAL

1.1 SUMMARY

- A. Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as are described in written Change Orders and/or modified Purchase Orders issued by the Owner after execution of the Contract, in accordance with the provisions of this Section.

1.2 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.
- B. Changes in the Work are described further in the General Conditions.
- C. Bulletins
 1. From time to time during progress of the Work, the Owner may issue a bulletin or sketch, which interprets the Contract Documents or order minor changes in the Work without change in Contract Sum or Contract Time.
 2. Should the Contractor consider that a change in Contract Sum or Contract Time is required, he shall submit an itemized Proposal to the Owner immediately and before proceeding with the Work. All proposals shall be submitted on the attached forms and shall conform to the requirements, breakdowns and markups identified. If the proposal is found to be satisfactory and in proper order, the Owner will issue a Change Order and/or a modified Purchase Order.
 3. Issuance of a bulletin or sketch is not to be considered a Change Order and is not authorization to proceed with the changes described therein.

1.3 QUALITY ASSURANCE

- A. The Owner will supply the Contractor with the standard City of Evanston Change Order form as attached.
- B. Include within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with these procedures for processing Change Order data.
- C. During progress of the Work, modify the Schedule of Values as approved by the Owner to reflect changes in the Contract Sum due to Change Orders.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Maintain a "Register of bulletins, sketches, supplemental instructions, proposals and change orders" at the job site, accurately reflecting current status of all pertinent data.
- B. Make the Register available to the Owner for review at their request.

1.5 PROCESSING BULLETINS AND PROPOSALS

- A. Make written reply to the Owner in response to each Bulletin using the standard City of Evanston Change Order Form as attached.

1. The contractor shall break down and describe all work and costs by subcontractors and general contractor in terms of trade, raw costs, markup, subtotal and total.
 2. The contractor shall include full backup data such as subcontractor's letter of proposal or similar information.
 3. The contractor shall be limited to the following markup percentages
 - a. Item I – subcontractor's markup on own work: 5%
 - b. Item IB – general contractor's overhead on subcontractor's work: 5%
 - c. Item II – general contractors markup on own work: 10%
 4. The contractor shall identify any extension of time required to perform the work associated with the proposal on the proposal form. No extension of time will be granted for proposal items after change orders are accepted.
 5. The contractor shall sign, date and submit proposal and accompanying backup data to the Owner for review.
- B. When the Owner and the Contractor have agreed upon cost or credit for the change, the Owner will issue a Change Order and/or a modified Purchase Order to the Contractor.

1.6 PROCESSING CHANGE ORDERS

- A. Change orders will be numbered in sequence and dated.
1. The Change Order will describe the change or changes, will refer to the proposal(s) and bulletin(s) involved and will be signed by the Owner and the Contractor.
 2. The Owner will issue two copies of each Change Order to the contractor.
 - a. The Contractor shall promptly sign both copies and return one copy to the Owner.
- B. A modified Purchase Order will be issued with a Change Order, when necessary, in accordance with the General Conditions.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 01 02 80

SECTION 01 04 50 – CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section establishes general requirements pertaining to cutting (including excavation), fitting and patching of the Work required.

1.2 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.
- B. Execute cutting (including excavation), filling or patching of work, required to:
 - 1. Make several parts fit properly.
 - 2. Uncover work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to the Contract requirements.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Install specified work in existing construction.
- C. In addition to Contract requirements, upon written instruction of the Owner:
 - 1. Uncover work to provide for observation of covered work.
 - 2. Remove samples of installed materials for testing.
 - 3. Remove work to provide for alteration of existing work.
- D. Do not cut or alter work of another contractor without written consent of the Owner.

1.3 SUBMITTALS

- A. Prior to cutting which affects structural safety of Project, or work of another contractor, submit written notice to the Owner requesting consent to proceed with cutting.
- B. Include the following:
 - 1. Project identification.
 - 2. Description of affected work.
 - 3. Necessity for cutting.
 - 4. Effect on other work and on structural integrity of Project.
 - 5. Description of proposed work. Designate:
 - a. Scope of cutting and patching.
 - b. Contractor and trades to execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing.
 - 6. Alternatives to cutting and patching.
 - 7. Designation of party responsible for cost of cutting and patching.
- C. Prior to cutting and patching done by instruction of Owner, submit cost estimate.
- D. Should conditions of work or schedule indicate change of materials or methods, submit recommendations to the Owner, including:
 - 1. Conditions indicating change.
 - 2. Recommendation for alternative materials or methods.

3. Submittals as required for substitutions.

E. Submit written notice to the Owner, designating time the work will be uncovered to provide for observation.

1.4 PAYMENT FOR COSTS

A. Costs caused by ill-timed or defective work, or work not conforming to Contract Documents: Party responsible for ill-timed, rejected or non-conforming work.

B. Work done on instruction of the Owner (by Change Order), other than defective or non-conforming work shall be paid for by the Owner.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. For replacement of work removed, comply with Specifications for type of work to be performed.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect existing conditions of work, including elements subject to movement or damage during:

1. Cutting and patching.
2. Excavating and backfilling

B. After uncovering work, inspect conditions affecting installation of new products.

3.2 PREPARATION

A. Prior to cutting:

1. Provide shoring, bracing and support as required to maintain structural integrity of project.
2. Provide protection for other portions of the project.
3. Provide protection from the elements.

3.3 PERFORMANCE

A. Execute fitting and adjustment or provide finished installation to comply with specified tolerances and finishes.

B. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.

C. Execute excavating and backfilling by methods which will prevent damage to other work, and will prevent settlement.

- D. Restore work which has been cut or removed; install new products to provide complete work in accordance with contract requirements.

- E. Refinish entire surfaces as necessary to provide an even finish.
 - 1. Continuous surfaces: to nearest intersection (s).
 - 2. Assembly: entire refinishing.

END OF SECTION

SECTION 01 05 10 – GRADES, LINES AND LEVELS

PART 1 – GENERAL

1.01 SUMMARY

- A. Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
 - 1. Establishing and maintaining grades, lines and levels;
 - 2. Structural design of shores, forms and similar items provided by the Contractor as part of the means and methods of establishing and maintaining grades lines and levels.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 OWNER WILL FURNISH

- A. A topographic map of the site as part of the Construction Documents, providing the following locations, dimensions and data:
 - 1. Grades, contours and lines of pavements and ground conditions.
 - 2. Above ground utility locations.
 - 3. Trees and vegetation.

1.04 SUBMITTALS

- A. Submit a record of Work performed and record survey data as required under provisions of Section 01 30 00 – SUBMITTALS and Section 01 72 00 – PROJECT RECORD DOCUMENTS.
- B. Comply with pertinent provisions of Section 01 30 00 – SUBMITTALS.
- C. Upon written request of the Owner, submit:
 - 1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
 - 2. Documentation verifying accuracy of field engineering work.
 - 3. Certification, signed by the contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or nonconformance with requirements of the Contract Documents.

1.05 CONSTRUCTION SURVEYS

- A. The Contractor shall employ a land surveyor, registered in the state of Illinois and acceptable to the Owner for verification of existing conditions and for layout of its own work including all lines, elevations and measurements of all site improvements, utilities and other work executed by it under the Contract.
- B. The Contractor shall immediately upon entering the site for purpose of beginning work locate general reference points and take such action as is necessary to prevent their destruction. The Contractor must exercise proper precaution to verify figures on the drawings before laying out work and will be held responsible for any error resulting from its failure to exercise such precaution.
- C. The Contractor shall make provision to preserve property line stakes, benchmarks or datum points. If any are lost, displaced or disturbed through neglect of the Contractor, its agents, or employees, the Contractor shall pay the cost of restoration.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify layout information shown on the Drawings, in relation to the plans before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

- B. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
 - 1. Promptly replace lost or destroyed project control points. Base replacements on original survey control points.
 - 2. Establish and maintain a minimum of two permanent benchmarks on the site or reference to data established by survey control points.
 - 3. Record benchmark locations with horizontal and vertical data on Project Record Documents.
 - C. The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site-work, investigate and verify the existence and location of underground utilities and other construction.
 - D. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas and water service piping.
- 3.02 PERFORMANCE
- A. Working from lines and levels established by the plans, establish benchmarks and markers to set lines and levels as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - B. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
 - C. As construction proceeds, check every major element for line, level and plumb.
 - D. Maintain a surveyor's log of control and other survey work. Make this log available at the job site for reference.
 - E. Record deviations from required lines and levels and advise the Owner when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
 - F. On completion of any work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and site-work. Deliver this certified survey to the Owner in hardcopy and electronic format (AutoCAD).
 - G. Locate and layout site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.
 - H. Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01 05 10

SECTION 01 06 00 – REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

- A. Contractors shall comply with all laws, rules and regulations governing the Work.
1. When Contractor observes that Contract Documents are in variance with specified codes, notify the Owner in writing immediately. The Owner will issue all changes in accord with the General Conditions.
 2. When Contractor performs any Work knowing or having reason to know that the Work is contrary to such laws, rules and regulations and fails to so notify the Owner, the Contractor shall pay all costs arising therefrom. However, it will not be the Contractor's primary responsibility to make certain that the Contract Documents are in accord with such laws, rules and regulations.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 DEFINITIONS AND ABBREVIATIONS

- A. Definitions
1. "Codes" means rules, regulations or statutory requirements of government agencies.
 2. "Standards" means requirements set by authorities, custom or general consent and establish accepted criteria.
- B. Abbreviations
- | | | |
|-----|--------|---|
| 1. | ADA | Americans with Disabilities Act |
| 2. | AGCI | Associated General Contractors in Illinois |
| 3. | ANSI | American National Standards Institute |
| 4. | ASHRAE | American Society of Heating, Refrigeration and Air Conditioning Engineers |
| 5. | ASTM | American Society of Testing and Materials |
| 7. | COE | City of Evanston |
| 8. | CPSC | Consumer Product Safety Commission (Federal) |
| 9. | FM | Factory Mutual Engineering Corp. |
| 9. | IBC | International Building Code |
| 10. | IDOL | Illinois Department of Labor |
| 11. | IDOT | Illinois Department of Transportation |
| 12. | IDPH | Illinois Department of Public Health |
| 13. | IEPA | Illinois Environmental Protection Agency |
| 14. | IECC | International Energy Conservation Code |
| 14. | ISPE | Illinois Society of Professional Engineers |
| 15. | NFPA | National Fire Protection Association |
| 16. | SFM | Office of State Fire Marshall |
| 17. | UL | Underwriters Laboratories, Inc. |

1.04 QUALITY ASSURANCE

- A. Contractor shall:
1. Ensure that copies of specified codes and standards are readily available to Contractor's personnel. Copies are available at Contractor's expense from source or publisher.
 2. Ensure that Contractor's personnel are familiar with workmanship and installation requirements of specified codes and standards.

1.05 REFERENCE SPECIFICATIONS

- A. The Specifications referred to herein shall be interpreted to mean the following and shall include all addenda, changes to, etc. Reference to Engineer shall mean Owner.

1. "Standard Specifications" – The Illinois Department of Transportation's (IDOT's) "Standard Specifications for Road and Bridge Construction", latest edition.
2. "Supplemental Specifications" – IDOT's "Supplemental Specifications and Recurring Special Provisions", latest edition.
3. "Traffic Specifications" – IDOT's "Standard Specifications for Traffic Control Items", latest edition.
4. "Standard Sewer Specifications" – The "Standard Specifications for Water and Sewer Main Construction in Illinois", latest edition.

1.06 REGULATORY REQUIREMENTS

A. Source and requirements:

1. EBA: "Environmental Barriers Act" Illinois Accessibility Code
2. ADA: Americans with Disabilities Act
3. ISPC: Illinois State Plumbing Code, current edition
4. IEPA: (current editions at date of bidding documents)
 - a. Air Pollution Standards
 - b. Noise Pollution Standards
 - c. Water Pollution Standards
 - d. Public Water Supplies
 - e. Solid Waste Standards
 - f. Illinois Recommended Standards for Sewage Work
5. Illinois Purchasing Act, as amended (Illinois Compiled Statutes, 30 ILCS 505/1 et seq)
6. OSFM:
 - a. Gasoline and Volatile Oils (Illinois Compiled Statutes, 430 ILCS 15/0.01 et seq)
 - b. Liquefied Petroleum Gases (Illinois Compiled Statutes, 430 ILCS 5/0.01 et seq)
 - c. Liquefied Petroleum Gas Containers (Illinois Compiled Statutes, 430 ILCS 10/0.01 et seq)
 - d. Boiler and Pressure Vessel Safety Act and Rules and Regulations (Illinois Compiled Statutes, 430 ILCS 75/1 et seq)
 - e. Illinois Rules and Regulations for Fire Prevention and Safety, as amended 24 December 1973.
7. CODES:
 - a. City of Evanston "City Ordinances" and "Building Code", current editions.
 - b. Work not covered by above codes: Use NFPA National Fire Codes, current edition.

- B. The Owner may reference other codes or standards throughout the Project Manual when deemed appropriate for proper compliance with regulatory requirements.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 06 00

SECTION 01 09 50 – REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.01 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.02 DEFINITIONS

- A. General: basic contract definitions are included in the General Conditions.
- B. Indicated: the term “indicated” refers to graphic representations, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as “shown,” “noted,” “scheduled” and “specified” are used, it is to help the reader locate the reference; no limitation on location is intended.
- C. Directed: terms such as “directed,” requested,” “authorized,” “selected,” “approved,” “required” and “permitted” mean “directed by the Owner,” “requested by the Owner” and similar phrases.
- D. Approve: the term “approved,” where used in conjunction with the Owner action on the Contractor’s submittals, applications and requests, is limited to the Owner’s duties and responsibilities as stated in the General Conditions.
- E. Regulation: the term “regulations” includes laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work.
- F. Furnish: the term “furnish” is used to mean “supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.”
- G. Install: the term “install” is used to describe operations at project site including the actual “unloading, unpacking, assembly, installation, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.”
- H. Provide: the term “provide” means “to furnish and install, complete and ready for the intended use.
- I. Installer: an “installer” is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1.03 INDUSTRY STANDARDS

- A. Applicability of Standards: except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
- C. Conflicting Requirements: where compliance with two or more standards is specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Owner for a decision before proceeding.
 - 1. Minimum Quality or Quantity Levels: the quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Owner for a decision before proceeding.
- D. Copies of Standards: each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity’s construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
 2. Although copies of standards needed for enforcement of requirements may be included as part of required submittals, the Owner reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.
- E. Abbreviations and Names: trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction or other entity applicable to the context of the text provision. Refer to the “Encyclopedia of Associations,” published by Gale Research Co., available in most libraries. The following acronyms or abbreviations as referenced in Contract Documents are defined to mean the associated names. Names and addresses are subject to change and are believed to be but are not assured to be accurate and up to date as of date of Contract Documents.

AA	Aluminum Assoc. 900 19 th St, NW, Suite 300 Washington, DC 20006 (202) 862-5100	AAMA	American Architectural Manufacturer’s Assoc. 1540 E. Dundee Rd, Suite 310 Palatine, IL 60067 (708) 202-1350	AAN	American Assoc. of Nurserymen 1250 Eye St, NW, Suite 500 Washington, DC 20005 (202) 789-2900
AASHTO	American Assoc. of State Highway and Transportation Officials 444 N. Capitol St, Suite 225 Washington, DC 20001 (202) 624-5800	ACI	American Concrete Institute PO Box 19150 Detroit, MI 48219-0150 (313) 532-2600	ACIL	American Council of Independent Laboratories 1725 K St, NW Washington, DC 20006 (202) 887-5872
ACPA	American Concrete Pipe Assoc. 8320 Old Courthouse Rd. Vienna, VA 22180 (703) 821-1990	AGA	American Gas Assoc. 1515 Wilson Blvd. Arlington, VA 22209 (703) 841-8400	AHA	American Hardboard Assoc. 520 N. Hicks Rd. Palatine, IL 60067-3609 (708) 934-8800
AI	Asphalt Institute Research Park Drive PO Box 14052 Lexington, KY 40512-4052 (606) 288-4960	AIA	American Institute of Architects 1735 New York Ave, NW Washington, DC 20006 (202) 626-7300	A.I.A.	American Insurance Assoc. 1130 Connecticut Ave, NW Washington, DC 20036 (202) 828-7100
AISC	American Institute of Steel Construction 1 E. Wacker Dr, Suite 3100 Chicago, IL 60601-2001 (312) 670-2400	AISI	American Iron and Steel Institute 1101 17 th St. NW, Suite 1300 Washington, DC 20005-2701 (202) 452-7100	AITC	American Institute of Timber Construction 11818 SE Mill Plain Blvd, Ste.415 Vancouver, WA 98684-5092 (206) 254-9132
ALI	Associated Laboratories 641 S. Vermont St. Palatine, IL 60067 (708) 358-7400	ALSC	American Lumber Standards Committee PO Box 210 Germantown, MD 20874 (301) 972-1700	ANSI	American National Standards Institute 11 W. 42 nd Street New York, NY 10036 (212) 354-3300
AOSA	Assoc. of Official Seed Analysts C/o Jim Lair Illinois Dept. of Agriculture Seed Lab Box 19281 Springfield, IL 62794 (217) 782-7655	APA	American Plywood Assoc. PO Box 11700 Tacoma, WA 98411 (206) 565-6600	API	American Petroleum Institute 1220 L St, NW Washington, DC 20005 (202) 682-8000
ASC	Adhesive and Sealant Council 1627 K Street, NW, Suite 1000 Washington, DC 20006 (202) 452-1500	ASHRAE	American Society of Heating, Refrigerating and Air- conditioning Engineers, Inc. 1791 Tullie Circle, NE Atlanta GA 30329-2305	ASME	American Society of Mechanical Engineers 345 East 47 th Street New York, NY 10017
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd, Suite 210 Westlake, CA 91362 (805) 495-7120	ASSE	American Society of Sanitary Engineers PO Box 40362 Bay Village, OH 44140 (216) 835-3040	ASTM	American Society for Testing and Materials 1916 Race St Philadelphia, PA 19103 (215) 299-5400
AWI	Architectural Woodwork Institute 2310 S. Walter Reed Dr. Arlington, VA 22206 (703) 671-9100	AWPA	American Wood Preservers Assoc. PO Box 286 Woodstock, MD 21163 (410) 465-3169	AWPB	American Wood Preservers Bureau PO Box 5283 Springfield, VA 22150 (703) 339-6660
AWS	American Welding Society	AWWA	American Water Works Assoc.	BANC	Brick Assoc. of North Carolina

	PO Box 351040 550 LeJeune Road, NW Miami, FL 33135 (305) 443-9353		6666 W Quincy Ave Denver, CO 80235 (303) 794-7711		PO Box 13290 Greensboro, NC 27415 (919) 273-5566
BHMA	Builders Hardware Manufacturers Assoc. 355 Lexington Ave, 17 th Floor New York, NY 10017 (212) 661-4261	BIA	Brick Institute of America 11490 Commerce Park Dr. Suite 300 Reston, VA 22091 (703) 620-0010	CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Rd, Ste 419 Chattanooga, TN 37421 (615) 892-0137
CRSI	Concrete Reinforcing Steel Institute 933 Plumb Grove Rd. Schaumburg, IL 60195 (708) 517-1200	EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591 (914) 332-0040	ETL	ETL Testing Laboratories Inc. PO Box 2040 Route 11, Industrial Park Cortland, NY 13045 (607) 753-6711
HMA	Hardwood Manufacturers Assoc. 2831 Airways Blvd., Ste 205, Bldg. B Memphis, TN 38132 (901) 346-2222	HPMA	Hardwood Plywood Manufacturers Assoc. 1825 Michael Farraday Dr PO Box 2789 Reston, VA 22090-2789 (703) 435-2900	ICEA	Insulated Cable Engineers Assoc. Inc. PO Box 440 South Yarmouth, MA 02664 (617) 394-4424
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47 th Street New York, NY 10017 (212) 705-7900	IESNA	Illuminating Engineering Society of North America 345 E 47 th Street New York, NY 10017 (212) 705-7926	ILI	Indiana Limestone Institute of America Stone City Bank Bldg, Ste 400 Bedford, IN 47421 (812) 275-4426
IMSA	International Municipal Signal Assoc. PO Box 539 1115 N. Main Street Newark, NY 14513 (315) 331-2182	IRI	Industrial Risk Insurers 85 Woodland St Hartford, CT 06102 (203) 520-7300	LPI	Lightning Protection Institute PO Box 1029 Woodstock, IL 60098 (815) 337-0277
MBMA	Metal Building Manufacturers Assoc. 1230 Keith Building Cleveland, OH 44115-2180	MCAA	Mechanical Contractors Assoc. of America 5410 Grosvenor Lane, Ste 120 Bethesda, MD 20814 (301) 897-0770	NAAMM	National Assoc. of Architectural Metal Manufacturers 600 S. Federal St, Ste 400 Chicago, IL 60605 (312) 922-6222
NAPA	National Asphalt Pavement Assoc. Calvert Building, Suite 620 6811 Kenilworth Ave. Riverdale, MD 20737 (301) 779-4880	NAPF	National Assoc. of Plastic Fabricators (Now DLPA)	NBGQA	National Building Granite Quarries Assoc. PO Box 482 Barre, VT 05641 (802) 476-3115
NBHA	National Builders hardware Assoc. (Now DHI)	NCMA	National Concrete Masonry Assoc. 2302 Horse Pen Rd PO Box 781 Herndon, VA 22070-3406 (703) 435-4900	NEC	National Electric Code (Now NfiPA)
NECA	National Electrical Contractors Assoc. 7315 Wisconsin Ave Bethesda, MD 20814 (301) 657-3110	NEMA	National Electrical Manufacturers Assoc. 2101 L St, NW, Ste 300 Washington, DC 20037 (202) 457-8400	NFiPA	National Fire Protection Assoc. 1 Battery March Park Quincy, MA 02269 (617) 770-3000
NFoPA	National Forest Products Assoc. 1250 Connecticut Ave, NW, Suite 200 Washington DC 20036 (202) 463-2700	NHLA	National Hardwood Lumber Assoc. PO Box 34518 Memphis, TN 38184 (901) 377-1818	NLGA	National Lumber Grades Authority 1055 W Hastings St. Ste 260 Vancouver, British Columbia Canada V6E 2H1 (604) 687-2171
NPA	National Particleboard Assoc. 18928 Premiere Court Gaithersburg, MD 20879-1569 (301) 670-0604	NPCA	National Paint and Coatings Assoc. 1500 Rhode Island Ave, NW Washington, DC 20005 (202) 462-6272	NSF	National Sanitation Foundation PO Box 1468 3475 Plymouth Rd Ann Arbor, MI 48106 (313) 769-8010
NWMA	National Woodwork Manufacturers Assoc. (Now NWWDA)	PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077-4321 (847) 966-6200	PCI	Prestressed Concrete Institute 175 W Jackson Blvd Chicago, IL 60604-9773 (312) 786-0300
PDI	Plumbing and Drainage Institute C/o Saul Baker 1106 W. 77 th Street, South Dr. Indianapolis, IN 4626 (317) 251-6970	RIS	Redwood Inspection Service 405 Enfrente Dr, Suite 300 Novato, CA 94949 (415) 382-0662	RMA	Rubber Manufacturers Assoc. 1400 K St, NW Washington, DC 20005 (202) 682-4800
SHLMA	Southern Hardwood Lumber Manufacturers Assoc. (Now HMA)	SJI	Steel Joist Institute Suite A 1205 48 th Ave North Myrtle Beach, SC 29577	SPIB	Southern Pine Inspection Bureau 4709 Scenic Highway Pensacola, FL 32504 (904) 434-2611

SSPC	Steel Structures Painting Council 4400 Fifth Ave. Pittsburgh, PA 15213 (412) 268-3327	SSPMA	Sump and Sewage Pump Manufacturers Assoc. 560 W Washington St, Ste 301 Chicago IL, 60606 (312) 332-4146	TPI	Truss Plate Institute 583 D'Onofrio Drive Suite 200 Madison, WI 53719
UL	Underwriters Laboratories 333 Pfingsten Rd. Northbrook, IL 60062 (847) 272-8800	WCLIB	West Coast Lumber Inspection Bureau PO Box 23145 Portland, OR 97223 (503) 639-0651	WIC	Woodwork Institute of California PO Box 11428 Fresno, CA 93773 (209) 233-9035
WRI	Wire Reinforcement Institute 1101 Connecticut Ave, NW Washington, DC 20036-4303 (703) 790-9790	WWPA	Western Wood Products Assoc. 522 SW 5 th Ave, Yeon Bldg. Portland, OR 97204-2122 (503) 224-3930	W.W.P.A.	Woven Wire Products Assoc. 2515 N. Nordica Ave. Chicago, IL 60635 (312) 637-1359

F. Federal Government Agencies: names and titles of federal government standard or specification producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard or specification producing agencies of the federal government. Names and addresses are subject to change; they are believed to be but are not assured to be accurate and up to date as of the date of the Contract Documents.

CE	Corps of Engineers (US Dept of the Army) Chief of Engineers – Referral Washington, DC 20314 (202) 272-0660	CFR	Code of Federal Regulations Available from the Government Printing Office N. Capitol St between G and H St, NW Washington, DC 20402 (202) 783-3238 (Material is usually first published in the Federal Register)	CPSC	Consumer Product Safety Commission 5401 Westbard Ave, Room 700 Washington, DC 20816 (800) 638-2772
CS	Commercial Standard (US Dept of Commerce) Government Printing Office Washington, DC 20402 (202) 377-2000	DOC	Department of Commerce 14 th St and Constitution Ave, NW Washington, DC 20230 (202) 377-2000	DOT	Department of Transportation 400 7 th St, SW Washington, DC 20590 (202) 366-4000
EPA	Environmental Protection Agency 401 M St, SW Washington, DC 20460 (202) 382-2090	FAA	Federal Aviation Administration (US Dept of Transportation) 800 Independence Ave, SW Washington, DC 20590 (202) 366-4000	FCC	Federal Communications Commission 1919 M St, NW Washington, DC 20554 (202) 632-7000
FHA	Federal Housing Administration (US Dept of Housing and Urban Development) Director Manufactured Housing and Construction Standards Division 451 7 th St, SW, Room 9158 Washington, DC 20201 (202) 755-5210	FS	Federal Specification (from GSA) Supt. Of Documents, Government Printing Office 7 th and D St, SW Washington, DC 20234 (202) 472-2205 or 472-2140	GSA	General Services Administration F St and 18 th St, NW Washington, DC 20405 (202) 472-1082
MIL	Military Standardization Documents (US Dept of Defense) Naval Publications and Forms Center 5801 Tabor Ave Philadelphia, PA 19120	NIST	National Institute of Standards and Technology (US Dept of Commerce) Gaithersburg, MD 20899 (301) 975-2000	OSHA	Occupational Safety and Health Administration (US Dept of Labor) Government Printing Office Washington, DC 20402 (202) 523-6091
PS	Product Standard of NBS National Institute of Standards and (DOC) Technology Standards Management Program A 625 Administration Gaithersburg, MD 20899 (202) 783-3238	USDA	US Dept of Agriculture Independence Ave btwn. 12 th and 14 th St, SW Washington, DC 20250 (202) 447-8732	USPS	US Postal Service 475 L'Enfant Plaza, SW Washington, DC 20260 (202) 268-2000

1.04 GOVERNING REGULATIONS/AUTHORITIES

A. The Owner has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents; that information may or

may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

- B. Copies of Regulations: Obtain copies of the applicable regulations and retain at the Project site, available for reference by parties who have a reasonable need for such reference.
- 1.05 SUBMITTALS
- A. Permits, Licenses and Certificates: for the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional, settlements, notices, receipts for fee payments, judgements and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 09 50

SECTION 01 10 50 – EXISTING UTILITY PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

- A. Perform the work associated with existing utilities, including removal, relocation, interruption and protection, meeting requirements of this section.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this section.

1.03 GENERAL

- A. Notification: before beginning any work, the Contractor shall notify all utility companies, public and private as applicable and any other party owning, operating or maintaining utility facilities on or in vicinity of project site in accordance with notification procedures of each utility company or any other party.

- B. Protection:

1. Before beginning any work, the Contractor shall investigate and inform himself of locations and extent of all utilities on and in vicinity of project site which may be encountered in performing the work and shall take suitable care to protect and prevent damage and cessation of operation to such utilities from his operations.
2. When performing adjacent to existing sewers, drains, water and gas lines; electric, telephone or telegraph conduit or cable; pole lines or poles, or other utility facilities, equipment or structures, which are to remain in operation, contractor shall maintain such utility facilities, equipment and structures in place and protect from damage and cessation of operation and shall cooperate with applicable utility company and any other party owning, operating or maintaining such utility facilities, equipment or structures.
3. Methods of protection shall be subject to approval of utility company and any other party owning, operating or maintaining such utility, equipment or structure.

- C. Damages:

1. Should existing utilities which are to remain in operation be damaged during construction operations, the Contractor shall immediately notify utility company, Owner and any other party owning, operating or maintaining such utility.
2. The Contractor shall be responsible for and shall repair or replace at the Contractor's expense, as applicable, damages to any such utility facilities, equipment or structures caused by his acts, whether negligent or otherwise, or his omission to act, whether negligent or otherwise, and shall leave such utility facilities, equipment or structures in as good condition as existed prior to commencement of his operations as approved by utility company and any other party owning, operating or maintaining such utility. In addition, the Contractor shall be responsible for any damages or liability which the Owner may be held liable. Materials and methods of repair or replacement shall be subject to approval of utility company and other party owning, operating or maintaining such utility.
3. However, any such utility equipment or structures damaged as a result of any act, or omission to act, of the Contractor, may, at option of applicable utility company and any other party owning, operating or maintaining such utility facilities, equipment or structures damaged, be repaired or replaced by such applicable utility company or other party. In such event cost of repairs or replacement shall be the responsibility of the Contractor at no addition to the Contract Sum.

1.04 PROCEDURES

A. Locations:

1. Request all utility companies and any other party owning, operating or maintaining utility facilities on or in vicinity of project site as applicable, to locate or stakeout locations, extent, alignment and elevation of such utility facilities.
2. Approximate locations and extent of known existing utility facilities, equipment and structures may be determined by examining documents of utility companies and any other party owning, operating or maintaining such utility facilities, and available information documents and Drawings for the work.
3. Should uncharted or incorrectly charted existing utility facilities, equipment and structures be encountered during performance of the Work, consult utility companies and other party owning, operating or maintaining such utility facilities for directions.
4. After such utilities have been uncovered and their actual locations and extent determined, the Owner will furnish additional Drawings, if relocation is required, subject to approval of utility companies and any other parties owning, operating or maintaining such utility facilities.
5. Submit record drawings showing locations and extent discrepancies of utilities those indicated in available reference documents or Drawings for the Work, regardless of cause of location or extent discrepancy, meeting, requirements of the general conditions.

B. Scheduling:

1. General: existing utilities shall not be disturbed until utility companies and any other party owning, operating or maintaining such utility facilities and users of such utilities have been notified in accordance with notification procedure of such utility companies or any other parties. Contractor shall conduct work so that utility may be removed, relocated or supported during construction operations and maintained in service until the work to be provided under Contract is completed.
2. Any existing utility should be relocated only as approved by utility companies and any other parties owning, operating or maintaining such utility facilities. Contractor shall cooperate with utility companies and any other parties in performance of this work.
3. Interruptions: when Contractor desires to take an existing utility service out of operation, notify Owner at least 72 hours in advance of such time and obtain written permission of utility company or other parties owning, operating or maintaining such utility facilities prior to interrupting service. Interruption of service shall be kept to an absolute minimum.
 - a. Utility company and any or other parties owning, operating or maintaining such utility facilities shall have right to require Contractor to perform work which requires such interruptions in stages and during non-standard working hours to reduce time of each interruption, at no addition to Contract Sum.
 - b. When necessary, provide acceptable temporary utility services during such interruptions, before taking utility service out of operation, at no addition to Contract Sum.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 011050

SECTION 01 20 00 – PROJECT MEETINGS

PART 1 – GENERAL

1.01 SUMMARY

- A. This section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-construction Conference
 - 2. Pre-installation Conferences
 - 3. Coordination Meetings
 - 4. Progress Meetings
- B. Construction schedules are specified in Section 01 30 00 – SUBMITTALS.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 PRE-CONSTRUCTION CONFERENCE

- A. The Owner shall schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conduct matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative construction schedule
 - 2. Critical Work sequencing
 - 3. Designation of responsible personnel
 - 4. Procedures for processing field decisions and Change Orders
 - 5. Procedures for processing Applications for Payment
 - 6. Distribution of Contract Documents
 - 7. Submittal of Shop Drawings, Product Data and Samples
 - 8. Preparation of record documents
 - 9. Use of the premises
 - 10. Office, Work and storage areas
 - 11. Equipment deliveries and priorities
 - 12. Safety procedures
 - 13. First aid
 - 14. Security
 - 15. Housekeeping
 - 16. Construction activity policies and working hours
 - 17. MBE/WBE/EBE and LEP requirements
 - 18. Coordination with affected utilities and governing jurisdictions

1.04 PRE-INSTALLATION CONFERENCE

- A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner of scheduled meeting dates.
- B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
 - 1. Contract Documents
 - 2. Options
 - 3. Related Change Orders

4. Purchases
 5. Deliveries
 6. Shop Drawings, Product Data and quality control samples
 7. Possible conflicts
 8. Compatibility problems
 9. Time schedules
 10. Weather limitations
 11. Manufacturer's recommendations
 12. Compatibility of materials
 13. Acceptability of substrates
 14. Temporary facilities
 15. Space and access limitations
 16. Governing regulations
 17. Safety
 18. Inspection and testing requirements
 19. Required performance results
 20. Recording requirements
 21. Protection
- C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner.
- D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.
- 1.05 PROGRESS MEETINGS
- A. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Owner of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment requests.
- B. Attendees: in addition to the Owner, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
- D. Contractor's Construction Schedule: review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Period.
- E. Review the present and future needs of each entity present, including such items as:
1. Interface requirements
 2. Time
 3. Sequences
 4. Deliveries
 5. Off-site fabrication problems
 6. Access
 7. Site utilization
 8. Temporary facilities and services
 9. Hours of Work
 10. Hazards and risks
 11. Housekeeping
 12. Quality and Work standards
 13. Change Orders

14. Documentation of information for payment requests.
- F. Reporting: no later than three (3) days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - G. Schedule Updating: revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 20 00

SECTION 01 21 00 - ALLOWANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Other provisions concerning Allowances also may be stated in other Sections of these Specifications.

1.2 SUMMARY

- A. The allowance is general and is to be used to provide adequate budget and bonding to cover items not able to be precisely determined by the Owner prior to bidding including any unforeseen conditions that are discovered. Allow within the proposed Total Base Bid Amount the amounts described in this Section.
- B. Allowance work shall be pre-approved prior to the start of and during the Construction with Proposals documenting the work to be performed, with clearly stated not-to-exceed costs and step by step method of procedures for the proposed work stated. Proposals must be submitted and accepted by the Owner prior to starting any allowance work. After discovering an unforeseen condition, the contractor shall submit a Proposal that includes a report summarizing the found condition. The Consultant and Owner will view the unforeseen condition to determine if the work will be authorized. Allowance work shall only be authorized by written Allowance Authorization. Under no circumstances shall the Contractor move forward with the work in question nor shall the contractor expend allowance without an approved Allowance Authorization.

1.3 ALLOWANCE RESPONSIBILITIES

- A. Consultant Responsibilities:
 - 1. Consult with Contractor in consideration and selection of products, suppliers and installers.
 - 2. Select products or services in consultation with Owner.
 - 3. Review method of procedure and costs documented on Proposals submitted by the Contractor and transmit Owner's decision to Contractor. Owner approved Allowance Authorizations are required prior to proceeding with Allowance Work.
 - 4. Review, recommend and transmit Allowance Authorization to Owner for approval.
 - 5. Transmit Owner's decision to the Contractor.
- B. Contractor's Responsibilities:
 - 1. Assist Consultant in selection of products, suppliers and installers.
 - 2. Obtain proposals from suppliers and installers and offer recommendations and review of proposals submitted. Transmit to Consultant on Proposal forms, attaching all supporting documentation. Include any bond cost adjustments with the proposal. Include scheduling information and assessment of impact of other work.
 - 3. On notification of selection by Consultant, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data and samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage and defects. Submit claims for transportation damage.
 - 6. Document thoroughly all costs related to the work.
 - 7. Provide the Consultant with fully documented Proposals detailing all allowance work to be performed.

1.4 ALLOWANCE DOCUMENTATION

- A. All work covered by Allowances must be thoroughly documented as follows:
 - 1. Upon encountering any field conditions which is not as shown in Construction Documents, the Contractor shall immediately notify the Consultant and develop a written

Proposal detailing any additional work required. Proposals shall include a report summarizing the found condition to the Consultant. Contractor work initiated without submitting a completed Proposal and obtaining the Owner's written approval by Allowance Authorization is performed entirely at Contractor's own risk and cost, regardless of any prior verbal approval.

2. The Consultant shall review the Proposal and provide the Owner with a written recommendation regarding the proposed work.
3. The Owner shall review the Contractor's Proposal and the Consultant's recommendation and, if appropriate, provide written approval via Allowance Authorization for use of the Allowance.

1.5 SCHEDULE OF ALLOWANCES

Allowance Number 1, Additional Work General:	\$350,000.00
Allowance Number 2, Temporary Fence Around Municipal Storage Facility:	\$100,000.00
Allowance Number 3, Furnishings (Not included on drawing sheet FFE2-1):	\$75,000.00
Allowance Number 4, Donor Wall Signage & Exterior Signage:	\$30,000.00

1.6 ALLOWANCE EXCLUSIONS

A. General

1. Additional costs related to improper scheduling, sequencing or coordination will not be covered within the Allowance, as determined solely by the Owner.

B. Existing Building Component Exclusions

1. All work required to protect existing building surfaces and components is included in the Base Bid and will not be covered within the Allowance.

PART 2 – PRODUCTS
(Not Used)

PART 3 – EXECUTION
(Not Used)

END OF SECTION 01 21 00

**CITY OF EVANSTON
ALLOWANCE AUTHORIZATION**

Authorization No. _____
Date: _____
Agreement Date: _____

PROJECT: _____
OWNER: _____
CONTRACTOR: _____

The following changes are hereby made to the **AGREEMENT**:

1.

Original CONSTRUCTION ALLOWANCE	_____
Current CONSTRUCTION ALLOWANCE	_____
This CHANGE	_____
CONSTRUCTION ALLOWANCE balance	_____
Original Date for Contract Completion	_____
Current Date for Contract Completion	_____
Time Extension (in calendar days)	_____
Modified date for Contract Completion	_____

Approved by (Owner): _____
City of Evanston _____ Date _____

Accepted by (Contractor): _____
(Contractor) _____ Date _____

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract. The Owner will supply the Contractor with the standard City of Evanston Allowance Authorization Form as attached.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Canopy at Southeast Corner.
 - 1. Provide canopy at south-east corner of building. Provide structural timber framing footing, uninsulated canopy roof, fascia, downspout and gutter. Refer to drawing sheets G1-4 and A4-3.
- B. Alternate No. 2: South Screen Wall at RTUs.
 - 1. Provide screenwall on the south side of rooftop RTU's. Coordinate with structure and mechanical. Refer to drawing sheets G1-4 and A4-3.
- C. Alternate No. 3: Adjacent Site Work.
 - 1. Provide new vehicular asphalt paving extending into the adjacent parcel, curb, chainlink fencing, and gate. Coordinate with City of Evanston, Landscape and Civil. Refer to drawing sheet AS1-1.
- D. Alternate No. 4: Tree Removal.
 - 1. Remove (2) existing trees outside of project boundary as indicated on drawing sheet G1-4 and AS1-0.
- E. Alternate No. 5: Additional Time
 - 1. Provide an alternate cost for extending the deadline for substantial completion to March 29, 2024 and the Final Completion to July 26, 2024.

END OF SECTION 012300

SECTION 01 27 00 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

- A. Unit price is a price per unit of measurement for materials or services provided in the Contract. The unit prices shall be added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, bonding, overhead, and profit.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

Unit Price No. 1 – Hazardous Waste Soil Removal:

Description: Excavate soil identified as hazardous waste and dispose of at a Subtitle C landfill.

Unit of Measurement: Cubic Yard

Unit Price No. 2 – Unsuitable Soil Removal and Replace with New Engineered Granular Fill:

Description: Excavate soil identified as unsuitable for load bearing capacity, dispose of soil, and replace with new engineered granular fill.

Unit of Measurement: Cubic Yard

END OF SECTION 01 27 00

SECTION 01 30 00 - SUBMITTALS

PART 1 – GENERAL

1.01 SUMMARY

- A. This section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's construction schedule
 - 2. Submittal schedule
 - 3. Daily construction reports
 - 4. Shop Drawings
 - 5. Product Data
 - 6. Samples
- B. Administrative Submittals: refer to other Division 0 and 1 sections and other Contract Documents for requirements for administrative submittals. Such submittals include but are not limited to:
 - 1. Permits
 - 2. Applications for payment
 - 3. Performance and payment bonds
 - 4. Insurance certificates
 - 5. List of subcontractors
- C. The Schedule of Values submittal is included in Section 01 02 70 – APPLICATION FOR PAYMENT.

1.02 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 SUBMITTAL PROCEDURES

- A. Coordination: coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 3. Processing: allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
 - a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Owner will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow two weeks for re-processing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Owner sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name
 - b. Date
 - c. Name and address of Owner
 - d. Name and address of Contractor
 - e. Name and address of subcontractor
 - f. Name and address of supplier
 - g. Name of manufacturer
 - h. Number and title of appropriate Specification Section
 - i. Drawing number and detail reference, as appropriate
- C. Submittal Transmittal: package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Owner using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
 2. Transmittal Form: use AIA Document G 810.
- 1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE
- A. Bar-Chart Schedule: prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 30 days of the date established for "Commencement of the Work".
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
 2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare a schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
 5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress report, payment requests and other schedules.
 6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for Owner's procedures necessary for certification of Substantial Completion.
- B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.
- C. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.
- D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

- E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating "pre-calculated" and "actual" costs. On the line show dollar-volume of Work performed as of the dates used for preparation of payment requests.
 - 1. Refer to Section 01 02 70 - APPLICATION FOR PAYMENT for cost reporting and payment procedures.
 - F. Distribution: Following response to the initial submittal, print and distribute copies to the Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
 - G. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.
- 1.05 SUBMITTAL SCHEDULE
- A. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.
 - 1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
 - 2. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
 - 1. Scheduled date for the first submittal.
 - 2. Related Section number.
 - 3. Submittal category.
 - 4. Name of subcontractor.
 - 5. Description of the part of the Work covered.
 - 6. Scheduled date for resubmittal.
 - 7. Scheduled date of the Owner's final release or approval.
 - B. Distribution: Following response to initial submittal, print and distribute copies to the Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
 - C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.
- 1.06 DAILY CONSTRUCTION REPORTS
- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Owner at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Approximate count of personnel at the site.
 - 3. High and low temperatures, general weather conditions.
 - 4. Accidents and unusual events.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, losses.
 - 7. Meter readings and similar recordings.
 - 8. Emergency procedures.
 - 9. Orders and requests of governing authorities.
 - 10. Change Orders received, implemented.
 - 11. Services connected, disconnected.
 - 12. Equipment or system tests and start-ups.

13. Partial Completions, occupancies.
 14. Substantial Completions authorized.
- 1.07 SHOP DRAWINGS
- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
 - B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 1. Dimensions.
 2. Identification of products and materials included.
 3. Compliance with specified standards.
 4. Notation of coordination requirements.
 5. Notation of dimensions established by field measurement.
 6. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 36" x 48".
 7. Submit one correctable translucent reproducible print and three blue- or black-line print for the Owner's review; the reproducible print will be returned.
 - C. One of the prints returned shall be marked-up and maintained as a "Record Document".
 - D. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.
 - E. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
 1. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.
- 1.08 PRODUCT DATA
- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
 1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.
 4. Submittals: Submit 2 copies of each required submittal; submit 4 copies where required for maintenance manuals. The Owner will retain one, and will return the other marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.09 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Owner's Sample. Include the following:
 - a. Generic description of the Sample.
 - b. Sample source.
 - c. Product name or name of manufacturer.
 - d. Compliance with recognized standards.
 - e. Availability and delivery time.
 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
 3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
 - a. Preliminary submittals will be reviewed and returned with the Owner's mark indicating selection and other action.
 4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
 5. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
- C. Mock ups specified in individual Sections are special types of Samples. Mock ups are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.

- D. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.
- 1.10 CONTRACTOR'S RESPONSIBILITIES
- A. Review shop drawings, product data and samples prior to submission.
 - B. Verify:
 - 1. Field dimensions
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - C. Coordinate each submittal with requirements of Work and of Contract Documents.
 - D. Contractor's responsibility for errors and omissions in submittals is not relieved by Owner's review of submittals.
 - E. Contractor's responsibility for deviations in submittals from Contract Document requirements is not relieved by Owner's review of submittals.
 - F. Notify Owner in writing at time of submission, of deviations in submittals from contract requirements.
 - G. Do not begin any work which requires submittals without having Owner's stamp and initials or signature indicating review.
 - H. After Owner's review, make response required by Owner, stamp and distribute copies.
- 1.11 SUBMISSION REQUIREMENTS
- A. Make all submissions within 35 business days after date of Notice to Proceed.
 - B. Submit number of copies of shop drawings, project data and samples which Contractor requires for distribution plus 3 copies which will be retained by the Owner.
 - C. Submit number of samples specified in each of specification sections.
 - D. Accompany submittals with transmittal letter, in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. The number of each shop drawing, product datum and sample submitted
 - 5. Notification of deviations from contract
 - 6. Other pertinent data
 - E. Submittals shall include:
 - 1. Date and revision dates
 - 2. Project title and number
 - 3. Names of:
 - a. Contractor
 - b. Subcontractor
 - c. Supplier
 - d. Manufacturer
 - e. Separate detailer when pertinent
 - 4. Identification of product or material
 - 5. Relation to adjacent structure or material
 - 6. Field dimensions, clearly identified as such
 - 7. Specification Section and page number
 - 8. Applicable standards, such as ASTM number or federal specification
 - 9. Identification of deviation(s) from Contract Documents
 - 10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with Contract.
- 1.12 RESUBMISSION REQUIREMENTS
- A. Shop drawings:
Revise initial drawings as required and resubmit as specified for initial submittal. Indicate on drawings all changes which have been made other than those requested by Owner.
 - B. Product Data and Samples:
Submit new datum and samples as required for initial submittal.
 - C. Make all resubmittals within 10 business days after date on Owner's stamp.

1.13 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

- A. Distribute copies of shop drawings and project datum which carry Owner's stamp:
 - 1. Contractor's file
 - 2. Job site file
 - 3. Record documents file
 - 4. Subcontractors
 - 5. Supplier
 - 6. Fabricator
 - B. Distribute samples as directed.
- 1.14 OWNER'S ACTION
- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Owner will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.
 - B. Action Stamp: The Owner will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
 - 1. Final Unrestricted Release: Where submittals are marked "Furnish as Submitted," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - 2. Final-But-Restricted Release: When submittals are marked "Furnish as Corrected," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 3. Returned for Resubmittal: When submittal is marked "Revise and Resubmit", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - 4. Returned, Improper Submittal: When submittal is marked "Rejected" do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication delivery or other activity. The submittal does not conform with project requirements. Prepare a new submittal without delay.
 - 5. Do not permit submittals marked "Rejected, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
 - 6. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 30 00

SECTION 01 3562 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Erosion and Sedimentation Control Program for the Project.

1.2 SUBMITTALS

- A. Erosion and Sediment Control Plan

1. Submit erosion and sediment control drawings specific to the site within ten (10) days of Notice To Proceed (NTP). Show locations, types and details of erosion and sediment control features and construction.
2. Show the schedule of implementation coordinated with the construction schedule.
3. Include a narrative describing the program and maintenance.

- B. Product Data

1. Silt Fence Geotextile Filter Fabric
2. Filter Baskets

- C. Documentation Log

1. Provide weekly inspection logs of inspection and maintenance of all erosion control procedures.
 - a. Include additional inspections for rainfalls over ½”.
2. Provide photographs during construction illustrating implementation of erosion control measures and on-going repairs/maintenance to these measures. At minimum photographs should be documented for:
 - a. Before Construction
 - b. During Construction
 - c. After Construction

1.3 QUALITY ASSURANCE

- A. Requirements: Create and implement an Erosion and Sedimentation Control plan, specific to the site, which conforms to the erosion and sedimentation requirements of the 2003 United States Environmental Protection Agency (EPA) Construction General Permit, OR local erosion and sedimentation control standards and codes, whichever is more stringent. The Construction

General Permit outlines the provisions necessary to comply with Phase I and Phase II Of the National Pollution Discharge Elimination (NPDES) program.

B. Objectives:

1. Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting stock pits for reuse.
2. Prevent sedimentation of storm sewer or receiving streams.
3. Prevent polluting the air with dust and particulate matter.

PART 2 - PRODUCTS

2.1 Silt Fence:

- A. Geotextile Filter Fabric: A nonwoven fabric consisting of previous sheets of propylene, nylon, polyester, or ethylene yarn. Certify material by manufacturer to meet the following requirements. Pre-assembled silt fencing may be substituted if it meets the above requirements.

<u>Property</u>	<u>Test Method</u>	<u>Requirements</u>
Minimum Tensile Strength	ASTM D4632	90 lb
Maximum Elongation at 45 lb	ASTM D4632	50% Max
Apparent Opening Size	ASTM D4751	AOS<60 mm
Minimum Permittivity	ASTM D4491	1x10 ⁻² SEC ⁻¹
Ultraviolet Exposure Strength Retention	ASTM D4355	70% @ 500h

- B. Posts: Wood or steel and a minimum 5 ft long. Wood posts shall be at least 4 in. dia. Or nominal 2 x 2 in. Steel posts shall be round or “U”, “T”, or “C” shaped with a minimum weight of 1.33 lb/ft and projections for fastening wire to fence. Wire Staples: 9 gage and minimum 1 in. long.

2.2 INLET FILTER

A. FILTER BASKETS

1. CATCH –ALL (or equal)
 As manufactured by:
 METRO DETROIT
 Price and Company, Inc.
 29165 Wall Street
 Wixom, MI 48393-3525

Toll Free: 866.960.4300
Local T: 248.596.4300
F: 248.596.4301
E: geopro@priceandcompany.com

2.3 CONSTRUCTION ENTRANCE

- A. Aggregate size: CA-1 or CA-4
- B. Geotextile fabric: shall meet the requirements of specification 592 Geotextile table 1 or 2, class I, II or IV of the Illinois Urban Manual.

2.4 TEMPORARY SEEDING PLANTS

- A. Shall be selected from the following:

TEMPORARY SEEDING SPECIES, RATES AND DATES

Species	Lbs/Acre	Lbs/1000 sf	Seeding dates
Oats	90	2	Early spring-July 1
Cereal Rye	90	2	Early spring-Sept. 30
Wheat	90	2	Early spring-Sept. 30
Perennial Ryegrass	25	0.6	Early spring-Sept. 30

PART 3 - EXECUTION

3.1 GENERAL

- A. Do not start operations until the erosion and sediment control plan has been submitted and features and in place.
- B. Comply with "Quality Assurance" provisions of these specifications and the erosion and sediment control plan.
- C. Schedule the Work in start to finish phases to minimize exposing the site to erosion.
- D. Install erosion and sediment control features before site disturbance begins and immediately after new inlets are installed.
- E. Do not allow storm water to flow into excavations and disturbed areas.
- F. Do not discharge water into sanitary sewers, watercourses or offsite.

- G. Do not discharge water-containing sediment in accordance with “Quality Assurance” requirements and as presented in the erosion and sediment control plan submittal or a maximum retained as 30 milligrams of sediment per liter of water. Conduct continuous monitoring of sediment.
- H. Maintain sediment control features. Inspect weekly and after every rain. Repair damaged bales, end runs and undercutting beneath bales. Repair breaks in diversion dams and damage down streams of the break. Replace damaged and deteriorated filter fabric and fences. Remove sediment which deposits fill 1/3 of the fabric surface area.
- I. Do not allow sediment to flow into vegetated areas.
- J. Retain all sediment on the site. Provide temporary stone roadways at exits from the site to ensure mud run-off of tires before exiting.
- K. Utilize the sizes of equipment appropriate to the task to minimize exhaust, noise and vibration.
- L. Mist or provide other means to keep dust from being scattered to the air.
- M. All sediment that gets onto public right-of-way must be removed immediately.
- N. During dewatering operations, water will be pumped into sediment basins or silt traps. Dewatering directly to field tiles or storm sewer is prohibited.
- O. Stock pile must be kept covered and watered for dust control.

3.2 INSTALLATION/APPLICATION/ERECTION

- A. General: Control surface water runoff on-site and provide temporary soil stabilization measures as required to prevent erosion of soil by action of water. Protect storm sewers adjacent to work site from sedimentation by installation of erosion and sediment control measures. Provide, as a first step in construction operations, barriers, and other measures intended to deter erosion and transport of sediment associated with construction activities before construction starts or as it progresses.
- B. Silt Fences: Space posts 6 ft maximum for non-reinforced or 10 ft maximum for reinforced and securely install with at least 2 feet of post in the ground. Excavate trench approximately 4 in. wide and 4 in. deep along line of posts and upslope side of posts using wire staples, tie wires, or hog rings. Extend wire and fence into trench a minimum of 4 in. Attach geo-textile filter fabric directly to posts and wire reinforcement fence as required by wire, staples, or other means. Install filter fabric in a manner such that fabric height above grade is 2 to 3 ft. Do not staple fabric to trees. Do not use fabric with defects or other damage. For manholes, the filter fabric can be placed around the lid and secured by the lid weight.
- C. Construction Entrance: Construct with minimum dimensions of 14’ wide, 70’ length and 6” thickness of CA-1 or CA-4. Filter fabric shall be used under the aggregate to minimize the migration of stone into the underlying soil by heavy vehicle loads. See plans for location.

- D. Temporary Seeding: Remove large rocks or other debris that may interfere with seedbed preparation or seeding operations. Prepare seedbed of 3 to 4 inches loose soil. If rainfall has caused the surface to become sealed or crusted, loosen, by suitable method, it just prior to seeding. Where pH is below 5.5 and seeding will not take place within 30 days, apply one and one half to two tons per acre of finely ground agricultural limestone. Seeding shall be evenly applied with a cyclone seeder, drill, culti-packer seeder or hydroseeder. Small grains shall be planted no more than one inch deep. Grasses shall be planted no more than one half inch deep.

END OF SECTION

SECTION 01 40 00 – QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Owner.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
 - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for the Contractor to provide quality control services required by the Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 RESPONSIBILITIES

- A. The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.
 - 1. The Owner will select and the Contractor shall employ and pay an independent agency, to perform specified quality control services.
 - a. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.
 - 2. Re-testing: The Contractor is responsible for re-testing where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
 - a. Cost of re-testing construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
 - 3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
 - a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
 - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

- d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 - e. Security and protection of samples and test equipment at the Project site.
 - B. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Owner and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.
 - 1. The agency shall notify the Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
 - 3. The agency shall not perform any duties of the Contractor.
 - C. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - 1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.
- 1.04 SUBMITTALS
 - A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Owner, in duplicate, and a copy to the Contractor.
 - 1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - 2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretations of test results.
 - j. Ambient conditions at the time of sample-taking and testing.
 - k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on re-testing.
- 1.05 QUALITY ASSURANCE
 - A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.
 - 1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Illinois.
 - B. Meet basic requirements of ASTM E329 Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction."
 - C. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection; with memorandum of remedies of all deficiencies reported by inspection.
 - D. Testing Equipment:
 - 1. Calibrated at maximum 12-month intervals by devices of accuracy traceable to either:
 - a. National Bureau of Standards
 - b. Accepted values of natural physical constants.
 - 2. Submit copy of certificate of calibration, made by accredited calibration agency.

1.06 LABORATORY DUTIES: LIMITS OF AUTHORITY

- A. Cooperate with Owner and Contractor; provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling and testing of materials and construction methods.
 - 1. Comply with specified Standards: ASTM, other recognized authorities, and as specified.
 - 2. Ascertain compliance with Contract requirements.
- C. Promptly notify Owner and Contractor of irregularities or deficiencies of work which are observed during performance of services.
- D. Promptly submit 5 copies of reports of inspections and tests to Owner including:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing Laboratory name and address
 - 4. Name and signature of Inspector
 - 5. Date of inspection and sampling
 - 6. Record of temperature and weather
 - 7. Date of test
 - 8. Identification of product and Specification Section
 - 9. Location in project
 - 10. Type of inspection or test
 - 11. Observations regarding compliance with Contract Documents
- E. Perform additional services as required by Owner.
- F. Laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on, Contract requirements.
 - 2. Approve or accept any portion of work.
 - 3. Perform any duties of the Contractor.

1.07 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Laboratory personnel, provide access to work, to manufacturer's operations.
- B. Provide Laboratory, preliminary representative samples of materials for testing, in required quantities.
- C. Furnish copies of mill test reports.
- D. Furnish casual labor and facilities:
 - 1. To provide access to work to be tested.
 - 2. To obtain and handle samples at site.
 - 3. To facilitate inspections and tests.
 - 4. For Laboratory's exclusive use for storage and curing of test samples.
- E. Notify Laboratory sufficiently in advance of operations to allow for personnel assignment of test scheduling.
- F. Employ, and pay for, services of a separate, equally qualified, Independent Testing Laboratory to perform additional inspections, sampling and testing required.
 - 1. For Contractor's convenience.
 - 2. When initial tests indicate work does not comply with Contract.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."
- B. Protect construction exposed by or for quality control services, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 40 00

SECTION 01 50 00 – TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

- A. This section specifies administrative and procedural requirements for temporary services and facilities, including utilities, construction and support facilities, and security and protection.
 - 1. Contractor shall be solely responsible for adequacy of temporary facilities, including design and engineering thereof.
- B. Construction and support facilities required include but are not limited to:
 - 1. Temporary roadway paving and/or steel plates.
 - 2. Field offices and/or storage sheds.
 - 3. Sanitary facilities, including toilets and drinking water.
 - 4. Dewatering facilities and drains.
 - 5. Temporary enclosures.
 - 6. Waste disposal services.
 - 7. Rodent and pest control.
 - 8. Construction aids and miscellaneous general services and facilities.
- C. Security and protection facilities and services required include but are not limited to:
 - 1. Barricades, warning signs and lights.
 - 2. Enclosure fences.
 - 3. Environmental protection.

1.02 RELATED WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 QUALITY ASSURANCE

- A. Regulations: comply with local codes and ordinances of governing authorities having jurisdiction.
- B. Standards: contractor determines and complies with applicable standards for temporary and construction facilities.
- C. Inspections: arrange for authorities having jurisdiction to inspect and test each utility before use. Obtain required certification and permits.

1.04 PROJECT CONDITIONS

- A. Conditions of use: keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Do not overload temporary services or facilities, or permit them to interfere with construction progress. Do not allow hazardous, dangerous or unsanitary conditions or public nuisances to develop or persist on the site.
- B. Easements: obtain necessary easements for temporary facilities when required.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. General: provide new materials and equipment or undamaged previously used materials and equipment in serviceable condition. Provide materials and equipment suitable for the use intended.
- B. Water: provide potable water approved by local health authorities.
- C. First aid supplies: comply with governing regulations.
- D. Fire extinguishers: provide hand-carried, portable UL-rated, class “A” fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable UL-rated, class “ABC” dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
 - 1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- E. Work zone traffic control: comply with IDOT 701 and 702.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Locate facilities where they will best serve the Project and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY INSTALLATION

- A. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITY INSTALLATION

- A. Storage and fabrication sheds (optional): install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces on the site.
- B. Sanitary facilities: comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - 1. Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.
 - 2. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
- C. Temporary enclosures: provide temporary enclosure for protection of construction in progress and completed from exposure, foul weather, other construction operations and similar activities.
 - 1. Where heat is needed, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.
- D. Temporary signs: prepare and install signs to inform the public and persons seeking entrance to the Project. Support on the posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
- E. Collection and disposal of waste: collect waste from project site daily. Comply with requirements of NFPA 241 for removal of combustible waste materials and debris. Enforce requirements strictly. Do not hold materials more than seven days during normal weather and three days when the temperature is expected to rise above 80 degrees Fahrenheit. Handle hazardous, dangerous or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.
- F. Temporary mailbox: provide temporary mailbox, meeting United States Postal Service (USPS) requirements, to maintain uninterrupted delivery of mail to Owner throughout duration of construction. Coordinate location with owner and USPS to allow access for daily mail delivery and retrieval of mail by Owner.

3.04 SHORING, BRACING AND UNDERPINNING (as required)

- A. Provide shoring and bracing necessary to protect existing buildings, streets, walkways, utilities and other improvements and excavation against loss of ground or caving embankments. Maintain shoring and bracing. Remove temporary shoring and bracing when no longer required.
- B. Whenever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system, adequately anchored and braced to resist earth and hydrostatic pressures.
- C. Shoring systems retaining earth on which the support or stability of existing structure is dependent must be left in place at completion of work.
- D. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- E. Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities and utilities.
- F. Repair or replace as acceptable by Owner, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

3.05 SECURITY AND PROTECTION FACILITIES

- A. Barricades, warning signs and lights: Comply with IDOT 701,702 and local code requirements. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- B. Environmental protection: provide environmental protection as outlined in Section 01 56 00 – TEMPORARY ENVIRONMENTAL CONTROLS.
- C. Site security to be provided by the Contractor as required.

3.06 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour a day basis where required to achieve indicated results and to avoid the possibility of damage.
- C. Termination and removal: remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
- D. Materials and facilities that constitute temporary facilities are the property of the Contractor.

END OF SECTION 01 50 00

SECTION 01 56 00 – TEMPORARY ENVIRONMENT CONTROLS

PART 1 - GENERAL

- 1.01 WORK INCLUDES
 - A. Contractors shall:
 - 1. Provide controls over environmental conditions at the construction site and related areas under the Contractor's control.
 - 2. Remove physical evidence of temporary controls at completion of work or as directed.
- 1.02 RELATED WORK
 - A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.
- 1.03 QUALITY CONTROL
 - A. Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control - "Green Book"
- 1.04 DUST CONTROL
 - A. Provide dust control materials to minimize dust from construction operations. Prevent air-borne dust from dispersing into the atmosphere.
 - B. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.
- 1.05 WATER CONTROL
 - A. Control surface water to prevent damage to the project, the site or adjoining properties.
 - 1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; direct drainage to proper runoff.
 - B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface water.
 - C. Dispose of drainage water in a manner to prevent flooding, erosion sitting or runoff of silt or sediment or other damage to all portions of the site or to adjoining areas.
- 1.06 RODENT CONTROL
 - A. Provide rodent control to prevent infestation of construction or storage areas.
 - 1. Use methods and materials, which will not adversely affect conditions at the site or on adjoining properties.
 - 2. Maintain site in clean condition.
 - a. Dispose of garbage and debris.
 - b. Do not keep items on site which attract rodents.
 - 3. When the use of rodenticides is deemed necessary, submit a copy of proposed program to the Owner. Clearly indicate:
 - a. Areas to be treated.
 - b. Rodenticides to be used, with copy of manufacturer's current printed instructions.
 - c. Pollution preventative measures to be employed.
 - d. Illinois licensed pesticides applicator.
- 1.06 DEBRIS CONTROL
 - A. Maintain all areas under Contractor's control free of extraneous debris.
 - B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas or along access roads and haul routes.
 - 1. Provide containers specified in SECTION 01 71 00 - CLEANING for deposit of debris.
 - 2. Prohibit overloading of trucks to prevent spillages on access and haul routes.
 - a. Provide daily inspection of traffic areas to enforce requirements.
 - C. Schedule collection and disposal of debris is specified in SECTION 01 71 00 - CLEANING.

1. Provide additional collections and disposals of debris whenever regular schedule is inadequate to prevent accumulation.
- 1.07 POLLUTION CONTROL
- A. Prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
 - B. Provide equipment and personnel, perform emergency measures to contain all spillages, and to remove contaminated soils or liquids. Excavate and dispose of all contaminated earth off-site. Replace with suitable compacted fill and topsoil.
 - C. Take special measures to prevent harmful substances from entering public waters or spilling onto the ground. Prevent disposal of wastes, effluents, chemicals or other such substances adjacent to streams, or in sanitary or storm sewers, including waste from portable toilets.
 - D. Provide systems for control of atmospheric pollutants.
 1. Prevent toxic concentrations of chemicals.
 2. Prevent harmful dispersal of pollutants into the atmosphere.
- 1.08 EROSION CONTROL
- A. Plan and execute construction and earthwork in a manner to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
 1. Minimize the areas of bare soil exposed at one time.
 2. Provide temporary control measures such as berms, dikes and drains.
 3. Provide temporary control measures to prevent silting or runoff of silt or sediment from site.
 - B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.
 - C. Periodically inspect earthwork to detect evidence of the start of erosion. Apply corrective measures to control erosion.

PART 2 - PRODUCTS
(NOT APPLICABLE)

PART 3 - EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 56 00

SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
 - 1. Section 01 50 00 "Temporary Facilities and Controls" for temporary site fencing.
 - 2. Section 31 10 00 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape or the average of the smallest and largest diameters at a height 54 inches (1372 mm) above the ground line for trees with caliper of 8 inches (200 mm) or greater as measured at a height of 12 inches (300 mm) above the ground.
- C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Meeting: Conduct meeting at Project Site, Manufacturer's Facility of Fabricator's Shop. Confirm with Owner and Landscape Architect 14 days prior to conference.

1. Before submitting submittals, review submittals, mockup and other requirements of this section and examine procedures for ensuring quality of the scope herein. Require representatives of each entity directly concerned with the scope herein, including but not limited to, the following:
 - a. Contractor's superintendent.
 - b. Subcontractor.
 - c. Special Subcontractor.
 - d. Independent testing agency responsible for testing.
 - e. Product manufacturer and/or local representative.
 - f. Authority Having Jurisdiction.
 - g. Landscape Architect.

2. Review methods and procedures related to the work of this section, including but not limited to, the following:
 - a. Responsibilities of each party.
 - b. Coordination of Landscape Architect's review of the work, including but not limited to:
 - 1) Site or Shop Visits to Review Samples and Mockups
 - 2) Site Visits to Observe General Construction Progress
 - 3) Site or Shop Visits to Review Fabrication Progress
 - 4) Site Visits to Review First Work In Place
 - 5) Site Visits for Punch List Review
 - 6) Site Visits for Punch List Completion Review
 - 7) Site Visit for Warranty Review
 - c. Lines of authority and communication for the project. Procedures for resolution of any project document ambiguity.
 - d. Methods for documenting, reporting, and distributing documents and reports.
 - e. Proposed sources of materials.
 - f. Procedures for packaging and storing archive samples.
 - g. Review of the time schedule for all installation and testing. Schedule of workdays and/or starting times if third party testing verification is required.
 - h. Quality control.
 - i. Temperature and weather limitations. Installation procedures for adverse weather conditions. Defining acceptable subgrade or ambient moisture and temperature conditions for working during installation.
 - j. Subgrade conditions, dewatering responsibilities, and subgrade maintenance plan.
 - k. Deployment techniques including allowable subgrade conditions.
 - l. Construction, material placement, and backfilling.
 - m. Requirements for protecting work, including restriction of traffic and adjacent work impacting during installation period and for remainder of construction period.
 - n. Measurement and payment schedules.
 - o. Health and safety.
 - p. Procedures and responsibilities for preparation and submission of as-built drawings.

1.5 COORDINATION

- A. Refer to Division 1 Requirements.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.
3. Indicate extent of trenching by hand or with air spade within protection zones.

- C. Samples: For each type of the following:

1. Organic Mulch: 1-quart (1-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

- D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For arborist and tree service firm.

- B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

E. Quality-control program.

1.8 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.9 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 1. Storage of construction materials, debris, or excavated material.
 2. Moving or parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry,

concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil.
 2. Planting Soil: Planting soil as specified in Section 32 91 13 "Soil Preparation."
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
1. Shredded hardwood.
 2. Size Range: 3 inches (76 mm) maximum.
 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
1. See tree protection details.
- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
1. Size and Text: As shown on Drawings.
 2. Lettering: 3-inch- (75-mm-) high minimum, black characters on red background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch (25-mm) green vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch (50-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.3 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people[and animals] from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Landscape Architect.
 3. Access Gates: Install where indicated; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Landscape Architect. Install one sign spaced approximately every 20 feet (6 m) on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.
 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
 2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only

smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Cut Ends: Do not paint cut root ends.
 - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 4. Cover exposed roots with burlap and water regularly.
 - 5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 6 inches (150 mm) inside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by Landscape Architect.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.

3. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and as indicated on Drawings.
 - a. Type of Pruning: Cleaning, raising, reducing, and thinning where indicated.
 - b. Specialty Pruning: Structural, restoration, vista, espalier, pollarding palm and utility where indicated.
- B. Unless otherwise directed by arborist and acceptable to Landscape Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and dispose off site.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
 1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch (50-mm) uniform thickness to remain.
- C. Soil Aeration: Where directed by Landscape Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 01 56 39

SECTION 01 60 00 – MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01 30 00 - SUBMITTALS.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 2. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.04 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
 - 1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Owner for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
 - 1. The Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of subcontractors.
 - 2. If a dispute arises between the general Contractor and subcontractors over concurrently selectable, but incompatible products, the Owner will determine which products shall be retained and which are incompatible and must be replaced.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view.
 - 1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
- D. Manufacturer's Instructions
 - 1. When contract documents specify that installation shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including the Owner.
 - 2. Maintain one set of complete instructions with the Project Record Documents at the job site during installation and until completion.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, or theft.
 - 3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 - 4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
 - 5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 - 6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
 - 7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
- B. Arrange for transportation and deliveries of materials and equipment in accord with approved current construction schedules and in ample time to facilitate inspection prior to installation.
- C. Coordinate deliveries to avoid conflict with work and conditions at site:
 - 1. Work of other contractors or Owner, or their use of premises.
 - 2. Limitations of storage space.
 - 3. Availability of equipment and personnel for handling products.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
 - 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 - 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Comply with size, make, type and quality specified.
 - 4. Manufactured and fabricated products:
 - a. Design, fabricate and assemble in accord with best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard interchangeable sizes.
 - c. Two or more items of the same kind shall be identical from the same manufacturer.
 - d. All system parts shall be from the same manufacturer to the greatest extent practical.
 - e. Adhere to equipment capacities, sizes and dimensions shown or specified unless variations are specifically approved by Change Order.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
 - 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 - 2. Semi-proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.

- a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract's provisions concerning "substitutions" to obtain approval for use of an unnamed product.
3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
6. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
7. Visual Matching: Where Specifications require matching an established Sample, the Owner's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.
8. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Owner will select the color, pattern and texture from the product line selected.
- C. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.
- D. Clearly mark partial deliveries of component parts or assemblies or equipment to permit easy identification of parts and to facilitate assembly.
- E. Immediately on delivery, inspect shipment to assure:
 1. Product complies with contract documents and Owner
 2. Quantities are correct.
 3. Containers and packages are intact and labels are legible.
 4. Products are properly protected and undamaged.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS:

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- B. Provide equipment and personnel to handle products and equipment, including those furnished by the Owner. Prevent damage to products or packaging.
- C. Provide additional protection during handling to prevent scraping, marring or otherwise damaging products, equipment or surrounding surfaces.
- D. Handle products and equipment in manner to prevent bending or overstressing.

- E. Lift packages, equipment or components only at designated lift points.

END OF SECTION 01 60 00

SECTION 01 63 00 – SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. Base all bids on providing all products exactly as specified.
- B. For products specified only by reference or performance standards, select any product which meets or exceeds standards, by any manufacturer, subject to the Owner's approval.
- C. For products specified by naming several products or manufacturers, select any product and manufacturer named.

1.02 RELATED WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Provisions and all other Divisions of the Project Manual, apply to this Section.

1.03 SUBSTITUTIONS, BIDDER/CONTRACTOR OPTIONS

- A. Prior to Bid Opening: The Owner will consider written requests to amend the bidding documents to add products not specified provided such requests are received at least 10 calendar days prior to bid opening date. Requests received after that time will not be considered. When a request is approved, the Owner will issue an appropriate addendum not less than three (3) calendar days prior to bid opening date.
- B. With Bid: A bidder may propose substitutions with his bid by completing the Product Substitution List in the Bid Form, subject to the provisions stated thereon. The Owner will review Proposed Product Substitution List of low bidder and recommend approval or rejection by the Owner prior to award of contract.
- C. After Award of Contract: No substitutions will be considered after Notice of Award except under one or more of the following conditions:
 - 1. Substitution required for compliance with final interpretations of code requirement or insurance regulations.
 - 2. Unavailability of specified products, through no fault of the Contractor.
 - 3. Subsequent information discloses inability of specified product to perform properly or to fit in designated space.
 - 4. Manufacturer/fabricator refusal to certify or guarantee performance of specified product as specified.
 - 5. When a substitution would be substantially to Owner's best interest.

1.04 SUBSTITUTION REQUIREMENTS

- A. Submit three (3) copies of each request for substitution. Include in request:
 - 1. Complete data substantiating compliance of proposed substitution with contract documents.
 - 2. For products:
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature:
 - 1) Product description
 - 2) Performance and test data
 - 3) Reference standards
 - c. Samples
 - d. Name and address of similar projects on which product was used and dates of installation.
 - 3. For construction methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustrating methods.
 - 4. Itemized comparison of proposed substitution with product or method specified.
 - 5. Data relating to changes in construction schedule.
 - 6. Identify:
 - a. Changes or coordination required.
 - b. Other contracts affected.

7. Accurate cost data on proposed substitution in comparison with product or method specified.
- B. In making request for substitution, bidder/contractor represents:
1. He has personally investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
 2. He will provide the same guarantee for substitution as for product or method specified.
 3. He will coordinate installation of accepted substitutions into the work, making all changes for work to be complete in all respects.
 4. Cost data is complete and includes all related costs under his contract, but excludes:
 - a. Owner's redesign.
 - b. Administrative costs of Owner.
 - c. Costs under separate contracts.
 5. He will pay all additional costs and expenses for Owner and other contractors.
- C. Substitutions will not be considered when:
1. They are indicated or implied on shop drawings or product data submittals without formal request submitted in accordance with this Section.
 2. Acceptance will require substantial revision of contract documents.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 63 00

SECTION 01 70 00 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. Substantial completion, final completion, closeout submittals, and application for final payment.
- B. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operating and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
 - 6. Final payment.

1.02 RELATED WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 SUBSTANTIAL COMPLETION

- A. When the Contractor considers the work substantially complete, Contractor shall submit written declaration to the Owner that the work, or designated portion thereof, is substantially complete. Include list of items to be completed or corrected.
- B. Owner and Contractor will make an inspection within seven days after receipt of certification.
- C. Should the Owner consider that the work is substantially complete:
 - 1. The Owner will prepare and issue a Certificate of Substantial Completion, containing:
 - a. Date of Substantial Completion.
 - b. Punch list of items to be completed or corrected.
 - c. The time within which Contractor shall complete or correct work of listed items. All punch list items must be completed within 30 days of substantial completion.
 - d. Date and time Owner will assume possession of work or designated portion thereof.
 - e. Responsibilities of Owner and Contractor for:
 - (1.) Insurance
 - (2.) Utilities
 - (3.) Operation of mechanical, electrical and other systems.
 - (4.) Maintenance and cleaning.
 - (5.) Security
 - f. Signatures of Owner and Contractor
- D. Should the Owner consider that work is not substantially completed:
 - 1. The Owner shall immediately notify Contractor, in writing, stating reasons.
 - 2. The Contractor shall complete work and send a second written notice to Owner, certifying that project, or designated portion of project, is substantially complete.
 - 3. The Owner will re-inspect work.

1.04 FINAL INSPECTION

- A. When the Contractor considers the work complete, the Contractor shall submit written declaration to the Owner that the work is complete. Contractor shall submit written certification that:
 - 1. Contract documents have been reviewed.
 - 2. Project has been inspected for compliance with contract.
 - 3. Work has been completed in accord with contract.
 - 4. Equipment and systems have been tested in the Owner's presence and are operational.
 - 5. Project is completed, ready for final inspection.
- B. The Owner will make final inspection within seven days after receipt of certification.
- C. Should the Owner consider that work is finally complete in accord with Contract Document requirements, he shall request contractor to make project closeout submittals.
- D. Should the Owner consider that work is not finally complete:
 - 1. The Owner shall notify the Contractor, in writing, stating reasons.

2. The Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the Owner certifying that the work is complete.
 3. The Owner will re-inspect work.
- 1.06 CLOSEOUT SUBMITTALS
- A. Project Record Documents: In accordance with requirements of SECTION 01 72 00 - PROJECT RECORD DOCUMENTS.
 - B. Deliver evidence of compliance with requirements of governing authorities.
 - C. Deliver Certificate of Insurance for products and completed operations. Certificate shall include a evidence that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days prior notice has been given to the Contractor. Contractor shall include a written statement that Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents.
 - D. Evidence of payments, release of liens
 1. Consent of Surety to Final Payment.
 2. Other data establishing payment or satisfaction of obligations including receipts, Contractor's releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and form as required by the City.
 3. Separate releases of waivers of liens for subcontractors, suppliers and others with lien rights against property of Owner together with list of those parties.
 4. Paid utility bills, if any.
 5. An affidavit that payrolls, bills for materials and equipment and other indebtedness connected to the work for which the City or the City's property might be responsible or encumbered (less any amounts withheld by City) have been paid or otherwise satisfied.
- 1.07 INSTRUCTION
- A. Instruct Owner's personnel in operation of all systems, mechanical, electrical and other equipment.
- 1.08 FINAL ADJUSTMENT OF ACCOUNTS
- A. Submit final statement of accounting to Owner.
 - B. Statement shall reflect all adjustments.
 1. Original contract sum.
 2. Additions and deductions resulting from:
 - a. Previous change orders.
 - b. Cash allowances.
 - c. Unit prices.
 - d. Other adjustments.
 - e. Deductions for uncorrected work.
 - f. Deductions for re-inspection payments.
 3. Total contract sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
 - C. The Owner will prepare final change order, reflecting approved adjustments to contract sum not previously made by change orders.
- 1.09 FINAL APPLICATION FOR PAYMENT
- A. Contractor shall submit final application in accord with requirements of Conditions of Contract.
- 1.10 FINAL CERTIFICATE FOR PAYMENT
- A. The Owner will issue final certificate in accord with provisions of Conditions of contract.
 - B. Should final completion be materially delayed through no fault of the Contractor, the Owner may issue a Semi-Final Certificate of Payment, in accord with provisions of Conditions of Contract.

PART 2 – PRODUCTS
(NOT APPLICABLE)

PART 3 – EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 70 00

SECTION 01 71 00 - CLEANING

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. Contractor shall maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by construction operations.
- B. At completion of work, Contractor shall remove waste materials, rubbish, tools, equipment, machinery and surplus materials, clean all sight-exposed surfaces and leave project clean and ready for occupancy.

1.02 RELATED WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 SAFETY REQUIREMENTS

- A. Standards: Maintain project in accord with following safety and insurance standards.
 - 1. Occupational Safety and Health Administration (OSHA).
- B. Hazards Control:
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- C. Conduct cleaning and disposal operations to comply with Federal, State and local ordinances and anti-pollution laws.
 - 1. Do not burn or bury debris, rubbish or other waste materials on project site.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.
- B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute cleaning to ensure that grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down materials and rubbish to lay dust and to prevent blowing dust.
- C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish complying with Section 017419 "Construction Waste Management and Disposal"
- G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.02 FINAL CLEANING

- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep

paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.

1. Remove tools, construction equipment, machinery and surplus material from the site.
 2. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 3. Remove debris and surface dust from limited access spaces.
 4. Remove labels that are not permanent labels.
 5. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
 6. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 7. Leave the Project clean and ready for occupancy.
- E. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
F. Broom clean paved surfaces; rake clean other surfaces on grounds.
G. Maintain cleaning until project, or designated portion thereof, is occupied by Owner.

END OF SECTION 01 71 00

SECTION 01 72 00 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. Maintenance of Documents
- B. Contractor shall:
 - 1. At project site, maintain one (1) copy of:
 - (a.) Contract drawings.
 - (b.) Project Manual.
 - (c.) Interpretations and supplemental instructions.
 - (d.) Addenda.
 - (e.) Reviewed, approved shop drawings and product data.
 - (f.) Other modifications to contract.
 - (g.) Field test records.
 - (h.) All schedules.
 - (i.) Correspondence file.
 - (j.) Change Orders
 - 2. Provide files and racks for document storage.
 - 3. File documents in format in accord with Project Manual Table of Contents.
 - 4. Maintain documents in clean, dry, legible condition.
 - 5. Do not use record documents for field construction purposes.
 - 6. Make documents available at all times for inspection by Owner.
 - 7. Furnish one (1) additional as-built record set of contract documents at the completion of the project. This set is not to be the set kept and updated periodically at the job site, but a clean set free of extraneous markings, notations, and erasures showing on a record of final conditions. Provide as-built record set in both PDF and AutoCAD formats.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 MARKING DEVICES

- A. Provide ballpoint pens, red color.

1.04 RECORDING

- A. Label each document "PROJECT RECORD DOCUMENTS" in 2" high printed letters.
- B. Keep record documents current, updated not less often than monthly.
- C. Do not permanently conceal any work until specified information has been recorded.
- D. Contract drawings: Legibly mark to record actual construction:
 - 1. Depths of various elements of foundation in relation to adjacent ground elevations.
 - 2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by change order.
 - 6. Details not on original contract drawings.
- E. Specifications and addenda: Legibly mark-up each section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by change order or field order.
 - 3. Other matters not originally specified.
- F. Shop drawings: Maintain as record documents; legibly annotate drawings to record changes made after review.

1.05 SUBMITTAL

- A. At completion of project, deliver record documents to Owner.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
 - 1. Date.

2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Certification that each document submitted is complete and accurate.
6. Signature of contractor, or his authorized representative.

PART 2 - PRODUCTS
(NOT APPLICABLE)

PART 3 - EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 72 00

SECTION 01 73 00 – OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. Contractor shall:
 - 1. Compile product data and related information appropriate for Owner's maintenance and operation of products and equipment provided under the Contract.
 - 2. Instruct Owner's personnel in operation and maintenance of products, equipment and systems.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 QUALITY ASSURANCE

- A. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.
 - 1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.
 - 2. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.
- B. Instructions for the Owner's Personnel: For instruction of the Owner's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the equipment or system involved.

1.04 SUBMITTALS

- A. Form: Manufacturer's standard product or equipment data of same type and form furnished to manufacturer's maintenance personnel.
- B. Provide sturdy manila or kraft envelope, properly labelled, of sufficient size to contain all submittals.
- C. Submit one copy of data in final form at least fifteen days before final inspection. This copy will be returned within fifteen days after final inspection, with comments.
 - 1. After final inspection make corrections or modifications to comply with the Owner's comments. Submit the specified number of copies of each approved manual to the Owner within fifteen days of receipt of the Owner's comments.
- D. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.
- E. Binders: For each manual, provide heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2" by 11" paper. Provide a clear plastic sleeve on the spine, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.
- F. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typewritten, on 8-1/2" by 11", 20 pound white bond paper.
- G. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.

1.04 MANUAL CONTENT

- A. Neatly typewritten table of contents for each volume, arranged in systematic order. Follow Project Manual format.
- B. In each manual include information specified in the individual Specification Section, and the following information for each major component of equipment and its controls:
 - 1. General system or equipment description.
 - 2. Design factors and assumptions.
 - 3. Copies of applicable Shop Drawings and Product Data.
 - 4. System or equipment identification, including:
 - a. Name of manufacturer.
 - b. Model number.

- c. Serial number of each component.
 5. Operating instructions.
 6. Emergency instructions.
 7. Wiring diagrams.
 8. Inspection and test procedures.
 9. Maintenance procedures and schedules.
 10. Precautions against improper use and maintenance.
 11. Copies of warranties.
 12. Repair instructions including spare parts listing.
 13. Sources of required maintenance materials and related services.
 14. Manual Index.
 15. Contractor, name of responsible principal, address and telephone number
 16. List with each product, the name, address and telephone number of:
 - a. Subcontractor
 - b. Maintenance contractor, as appropriate.
 - c. Identify area of responsibility of each
 - d. Local supply source for parts and replacement.
- C. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service Contract issued.
- D. General Information: Provide a general information Section immediately following the Table of Contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the Subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.
- E. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information that is not applicable.
- F. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.
- G. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation.
- H. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.
- I. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond.
 1. Contractor, name of responsible principal, address and telephone number.
 2. List of each product specified to be included, indexed to volume content.
 3. List with each product, the name, address and telephone number of:
 - a. Subcontractor.
 - b. Maintenance contractor, as appropriate.
 - c. Identify area of responsibility of each.
 - d. Local supply source for parts and replacement.
- J. Product Data:
 1. Include only sheets pertinent to specific product.
 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.

- c. Delete references to inapplicable installation.
 - K. Drawings:
 - 1. Supplement product data with drawings to clearly illustrate relationship of component parts of equipment and systems and control and flow diagrams.
 - 2. Coordinate drawings with information in Product Record Documents to assure correct illustration of completed installation.
 - 3. Do not use Project Record Documents as maintenance drawings.
 - L. Written text to supplement product data for particular installation:
 - 1. Organize in consistent format under separate headings for different procedures.
 - 2. Provide logical sequence of instructions for each procedure.
 - M. Copy of each warranty, bond and service contract issued.
 - 1. Provide information sheet for Owner personnel. Give:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties or bonds.
- 1.05 MANUAL FOR MATERIALS AND FINISHES
- A. Submit two (2) copies of complete manual in final form.
 - B. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.
 - C. Content for products, applied materials and finishes:
 - 1. Manufacturer's data, giving full information on products.
 - a. Catalog number, size, composition.
 - b. Color and texture designations.
 - c. Information for re-ordering special-manufactured products.
 - 2. Instructions for care and maintenance.
 - a. Manufacturer's recommendations for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods detrimental to product.
 - c. Recommended cleaning and maintenance schedule.
 - D. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes.
 - E. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
 - 1. Applicable standards.
 - 2. Chemical composition.
 - 3. Installation details.
 - 4. Inspection procedures.
 - 5. Maintenance information.
 - 6. Repair procedures.

PART 2 - PRODUCTS
(NOT APPLICABLE)

PART 3 - EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 73 00

SECTION 01 74 00 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Warranties for the Work and products and installations of each Contractor shall be one (1) year unless specified otherwise on the Drawings or in the individual Sections of Divisions 2 through 16.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Contractors required to countersign special warranties with the Contractor.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all other Divisions of the Project Manual, apply to this Section.

1.03 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requires of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.
 - 1. Rejection of Warranties: The Owner reserves the rights to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- F. For specific warranty requirements related to landscape materials, refer to the applicable Section.

1.04 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. If the Owner's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.
- B. Form of Submittal: At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

- C. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name, and the name of the Contractor.
 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS
(NOT APPLICABLE)

PART 3 - EXECUTION
(NOT APPLICABLE)

END OF SECTION 01 74 00

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
 - 2. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
 - 3. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Brick.
 - e. Concrete masonry units.
 - f. Wood studs.
 - g. Wood joists.
 - h. Plywood and oriented strand board.
 - i. Wood paneling.
 - j. Wood trim.
 - k. Structural and miscellaneous steel.
 - l. Rough hardware.
 - m. Roofing.
 - n. Insulation.
 - o. Doors and frames.
 - p. Door hardware.
 - q. Windows.
 - r. Glazing.
 - s. Metal studs.
 - t. Gypsum board.
 - u. Acoustical tile and panels.
 - v. Carpet.
 - w. Carpet pad.
 - x. Demountable partitions.
 - y. Equipment.
 - z. Cabinets.
 - aa. Plumbing fixtures.
 - bb. Piping.
 - cc. Supports and hangers.
 - dd. Valves.
 - ee. Sprinklers.
 - ff. Mechanical equipment.
 - gg. Refrigerants.
 - hh. Electrical conduit.
 - ii. Copper wiring.
 - jj. Lighting fixtures.
 - kk. Lamps.
 - ll. Ballasts.
 - mm. Electrical devices.
 - nn. Switchgear and panelboards.

- oo. Transformers.
 - 2. Construction Waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Electrical conduit.
 - l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.
- 1.5 ACTION SUBMITTALS
- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons (tonnes).
 - 4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
 - 5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. LEED Submittal: Submit documentation to USGBC, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Respond to questions and requests from USGBC regarding construction waste management and disposal until the USGBC has made its determination on the Project's LEED certification application. Document correspondence with USGBC as informational submittals.
- H. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.
 - 1. Firm employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.
 - 2. Waste management coordinator may also serve as LEED coordinator.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
 1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.

6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 VENDORS

- A. Source Limitation: Groot is the sole vendor for dumpsters and waste hauling allowed by Owner.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 015000 "Temporary Facilities" and Section 015600 "Temporary Environmental Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Sale and Donation: Permitted on Project site.
- B. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- E. Plumbing Fixtures: Separate by type and size.
- F. Lighting Fixtures: Separate lamps by type and protect from breakage.
- G. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 1. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- K. Carpet Tile: Remove debris, trash, and adhesive.
 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

- L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- M. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

- 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- 2. Polystyrene Packaging: Separate and bag materials.
- 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

- 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
- 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

- 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

- 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
- 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.7 FORMS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 cost/revenue analysis of demolition waste reduction work plan.
- G. Form CWM-7 for construction waste
- H. Form CWM-8 for demolition waste.

END OF SECTION 017419

SECTION 018113.14 - SUSTAINABLE DESIGN REQUIREMENTS - LEED v4 BD+C

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Silver certification based on USGBC's LEED v4 BD+C.
 - 1. Specific requirements for LEED are also included in other Sections.
 - 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 - 3. A copy of the LEED Project checklist is shown on the Drawings for information only.
 - a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

1.3 DEFINITIONS

- A. LEED: USGBC's "LEED Version 4 for Building Design and Construction."
 - 1. Definitions that are a part of "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) apply to this Section.
- B. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- C. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

- D. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site. Review LEED requirements and action plans for meeting requirements.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the Project's LEED certification application. Document responses as informational submittals.
- B. Submit documentation to USGBC and respond to questions and requests from USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the Project's LEED certification application.
 - 1. Document correspondence with USGBC as informational submittals.

1.6 ACTION SUBMITTALS

- A. General: Submit additional sustainable design submittals required by other Specification Sections.
- B. Sustainable design submittals are in addition to other submittals.
 - 1. If submitted item is identical to that submitted to comply with other requirements, include an additional copy with other submittal as a record copy of compliance with indicated LEED requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."
- C. Sustainable Design Documentation Submittals:
 - 1. Environmental Product Declarations complying with LEED requirements.

2. Documentation for products that comply with LEED requirements for multi-attribute optimization.
 - a. Include documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.
3. Sustainability reports for products that comply with LEED requirements for raw material and source extraction reporting.
4. Documentation for products that comply with LEED requirements for leadership extraction practices. Include the following:
 - a. Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
 - b. Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
 - c. Product data and chain-of-custody certificates for products containing certified wood. Include statement of costs.
 - d. Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
 - e. Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement of costs.
 - f. Documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.
5. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting.
6. Documentation for products that comply with LEED requirements for material ingredient optimization.
7. Documentation for products that comply with LEED requirements for product manufacturer supply chain optimization.
 - a. Include documentation for regional materials, indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material and costs of regional materials.
8. Documentation complying with Section 017419 "Construction Waste Management and Disposal."
9. Product data for adhesives and sealants used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
10. Product data for paints and coatings used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
11. Laboratory test reports for flooring, indicating compliance with requirements for low-emitting materials.

12. Laboratory test reports for products containing composite wood or agrifiber products or wood glues, indicating compliance with requirements for low-emitting materials.
13. Laboratory test reports for ceilings, walls, and thermal insulation, indicating compliance with requirements for low-emitting materials.
14. Construction Indoor-Air-Quality (IAQ) Management:
 - a. Construction IAQ management plan.
 - b. Product data for temporary filtration media.
 - c. Product data for filtration media used during occupancy.
 - d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
15. IAQ Assessment:
 - a. Signed statement describing the building air flush-out procedures, including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
 - b. Product data for filtration media used during flush-out and occupancy.
 - c. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
 1. Plumbing.
 2. Mechanical.
 3. Electrical.
 4. Specialty items, such as elevators and equipment.
- C. Sustainable Design Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed, indicating how the following requirements will be met:
 1. List of proposed products with Environmental Product Declarations.
 2. List of proposed products complying with requirements for multi-attribute optimization.
 3. List of proposed products complying with requirements for raw material and source extraction reporting.
 4. List of proposed products complying with requirements for leadership extraction practices.
 5. List of proposed products complying with requirements for material ingredient reporting.
 6. List of proposed products complying with requirements for material ingredient optimization.

7. List of proposed products complying with requirements for product manufacturer supply chain optimization.
 8. Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
 9. Construction IAQ management plan.
- D. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

1.8 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-accredited professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to these LEED credits, the Contractor shall provide additional materials and procedures necessary to obtain LEED credits indicated.
- B. At least 20 different products from at least five different manufacturers shall have Environmental Product Declarations that comply with LEED requirements. Industry-wide (generic) Environmental Product Declarations shall be valued as one-half of a product.
- C. At least 50 percent, by cost, of the permanently installed products for the Project shall comply with LEED requirements for multi-attribute optimization.
- D. At least 20 different products from at least five different manufacturers shall have publically released reports that comply with LEED requirements for raw material source and extraction reporting. Self-declared reports by manufacturers shall be valued as one-half of a product.
- E. At least 20 different products from at least five different manufacturers shall comply with LEED requirements for material ingredient reporting.
- F. At least 25 percent, by cost, of the permanently installed products for the Project shall comply with LEED requirements for material ingredient optimization.
- G. At least 25 percent, by cost, of the permanently installed products for the Project shall comply with LEED requirements for product manufacturer supply chain optimization.
- H. Extended Producer Responsibility Program: Not less than **<Insert number>** percent of building materials, by cost, shall be manufactured by a participant in an extended producer responsibility program.

- I. Recycled Content: Building materials shall have recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes a minimum of <Insert number> percent of cost of materials used for Project.
 - 1. Cost of postconsumer recycled content plus one-half of preconsumer recycled content of an item shall be determined by dividing weight of postconsumer recycled content plus one-half of preconsumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 - 2. Do not include plumbing, mechanical and electrical components, and specialty items, such as elevators and equipment, in the calculation.

- J. Certified Wood: Not less than <Insert number> percent, by cost, of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

2.2 LOW-EMITTING MATERIALS

- A. Paints and Coatings: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 50 g/L.
 - 3. Dry-Fog Coatings: 150 g/L.
 - 4. Primers, Sealers, and Undercoaters: 100 g/L.
 - 5. Rust-Preventive Coatings: 100 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Clear Wood Finishes, Varnishes: 275 g/L.
 - 9. Clear Wood Finishes, Lacquers: 275 g/L.
 - 10. Floor Coatings: 50 g/L.
 - 11. Shellacs, Clear: 730 g/L.
 - 12. Shellacs, Pigmented: 550 g/L.
 - 13. Stains: 100 g/L.

- B. Paints and Coatings: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Adhesives and Sealants: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Wood Glues: 30 g/L.
 - 2. Metal-to-Metal Adhesives: 30 g/L.
 - 3. Adhesives for Porous Materials (Except Wood): 50 g/L.
 - 4. Subfloor Adhesives: 50 g/L.
 - 5. Plastic Foam Adhesives: 50 g/L.

6. Carpet Adhesives: 50 g/L.
 7. Carpet Pad Adhesives: 50 g/L.
 8. VCT and Asphalt Tile Adhesives: 50 g/L.
 9. Cove Base Adhesives: 50 g/L.
 10. Gypsum Board and Panel Adhesives: 50 g/L.
 11. Rubber Floor Adhesives: 60 g/L.
 12. Ceramic Tile Adhesives: 65 g/L.
 13. Multipurpose Construction Adhesives: 70 g/L.
 14. Fiberglass Adhesives: 80 g/L.
 15. Contact Adhesives: 80 g/L.
 16. Structural Glazing Adhesives: 100 g/L.
 17. Wood Flooring Adhesives: 100 g/L.
 18. Structural Wood Member Adhesives: 140 g/L.
 19. Single-Ply Roof Membrane Adhesives: 250 g/L.
 20. Special-Purpose Contact Adhesives (That Are Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
 21. Top and Trim Adhesives: 250 g/L.
 22. Plastic Cement Welding Compounds: 250 g/L.
 23. ABS Welding Compounds: 325 g/L.
 24. CPVC Welding Compounds: 490 g/L.
 25. PVC Welding Compounds: 510 g/L.
 26. Adhesive Primer for Plastic: 550 g/L.
 27. Sheet-Applied Rubber Lining Adhesives: 850 g/L.
 28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
 29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
 30. Special-Purpose Aerosol Adhesives (All Types): 70 percent by weight.
 31. Other Adhesives: 250 g/L.
 32. Architectural Sealants: 250 g/L.
 33. Nonmembrane Roof Sealants: 300 g/L.
 34. Single-Ply Roof Membrane Sealants: 450 g/L.
 35. Other Sealants: 420 g/L.
 36. Sealant Primers for Nonporous Substrates: 250 g/L.
 37. Sealant Primers for Porous Substrates: 775 g/L.
 38. Modified Bituminous Sealant Primers: 500 g/L.
 39. Other Sealant Primers: 750 g/L.
- D. Adhesives and Sealants: For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Flooring: Flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Composite Wood: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

- G. Ceilings, Walls, and Thermal Insulation: Ceilings, walls, and thermal insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

- A. Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with Section 017419 "Construction Waste Management and Disposal."

3.3 CONSTRUCTION IAQ MANAGEMENT

- A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
 - 1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install MERV 8 filter media at each return-air inlet for the air-handling system used during construction.
 - 2. Replace air filters immediately prior to occupancy.

3.4 IAQ ASSESSMENT

- A. Flush-Out:

After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent. The flush-out will last for a 14-30 day period, or longer if needed, and will encompass the following items:

 - 1. The HVAC filtration media will be replaced prior to the beginning of the flush-out period and again prior to occupancy
 - 2. The filtration media will have a Minimum Efficiency Reporting Value (MERV) of 13.
 - 3. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. (1 070 000 L) of outdoor air per sq. ft. (sq. m) of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. (1.52 L/s per sq. m) of outside air or the design minimum outside-air rate, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during

occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. (4 300 000 L/sq. m) of outside air has been delivered to the space.

B. Air-Quality Testing: Engage testing agency selected by the Owner to perform the following:

1. Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "LEED Reference Guide for Building Design and Construction."
2. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
 - a. Formaldehyde: 27 ppb.
 - b. Particulates (PM10): 50 micrograms/cu. m.
 - c. Ozone: 0.075 ppm, according to ASTM D 5149.
 - d. Total Volatile Organic Compounds: 500 micrograms/cu. m.
 - e. 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
 - f. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
 - g. Target Chemicals in California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Table 4-1 (except formaldehyde): Allowable concentrations in California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers," Table 4-1.
3. For each sampling point where the maximum concentration limits are exceeded, take corrective action until requirements have been met.
4. Air-sample testing shall be conducted as follows:
 - a. All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside-air flow rate for the occupied mode throughout the duration of the air testing.
 - b. Building shall have all interior finishes installed, including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings, such as workstations and partitions, are encouraged, but not required, to be in place for the testing.
 - c. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 5000 sq. ft. (465 sq. m).
 - d. Air samples shall be collected between 3 and 6 feet (900 and 1800 mm) from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION 018113.14

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Commissioning: Commissioning (Cx) is a systematic documented process of verifying that building systems perform interactively according to the design intent and the Owner's operational needs. Commissioning during the construction phase is intended to achieve the following specific objectives:
 - 1. Review of the Engineer's drawings and specifications during design development and construction document phases.
 - 2. Review of submittals related to the building equipment and systems forwarded to the CxA by the CM.
 - 3. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 4. Verify that systems are installed in accordance with the Owner's Project Requirements (OPR).
 - 5. Verify and document proper performance of equipment and systems.
 - 6. Verify that operating and maintenance (O&M) documentation is complete.
 - 7. Verify that the Owner's operating personnel are adequately trained.
 - 8. Verify and complete appropriate initial performance tests and documentation, and schedule seasonal tests. Verify seasonal testing and deferred testing is complete.
 - 9. Review building operations 10 months after substantial completion.
 - 10. Develop an ongoing commissioning plan.
- B. Commissioning shall comply with and follow ASHRAE Guideline 0 and 1.
- C. This project is pursuing a LEED v4 Silver Certification.
- D. Systems to be commissioned: Refer to related sections for a listing of the commissioned systems.
- E. Commissioning requires the participation of affected Division contractors (Subs) to ensure that all systems are operating in a manner consistent with the Contract Documents. All affected Division contractors shall be familiar with:
 - 1. All parts of the commissioning plan issued by the Commissioning Authority (CxA)
 - 2. The Owner's Project Requirements (OPR)

- F. Commissioning Team: The members of the commissioning team consist of the following:
1. Commissioning Authority (CxA)
 2. The designated representative of the Owner
 3. The Construction Manager (CM)
 4. The Subcontractor (Sub)
 5. The Architect (A/E)
 6. The design engineers or Engineer of Record (EOR), particularly the mechanical engineer
 7. The Mechanical Contractor (MC)
 8. The Electrical Contractor (EC)
 9. The Testing, Adjusting and Balancing (TAB) representative
 10. The Controls Contractor (CC) installing the Energy Management System (EMS) or Building Management and Control System (BMCS)
 11. Any other installing subcontractors or suppliers of equipment
 12. The Owner's building or plant operator/engineer

1.3 RELATED SECTIONS

- A. The Work of this section applies to all commissioning Work listed in all divisions of these specifications and particularly to the following:
1. 22 08 00 – Commissioning of Plumbing
 2. 23 05 93 – Testing, Adjusting and Balancing for HVAC
 3. 23 08 00 – Commissioning of HVAC
 4. 26 08 00 – Commissioning of Electrical Systems

1.4 DEFINITIONS AND ABBREVIATIONS

- A. Terms used in this section shall have the following meanings:
1. "As Built" drawings – Fully dimensioned, to-scale, drawings that present an accurate representation of the components and assemblies as they exist in the built Work; where allowed by other Division 1 specification sections these can be legible hand marks on hard copies of drawings kept on the job site.
 2. "Basis of Design" (BOD) – A document developed by the design team that details all assumptions made during the creation of the construction documents to meet the Owner's Project Requirements (OPR).
 3. "Commissioning" – A quality assurance process to provide documented verification that the building equipment and systems function in compliance with criteria established in the project documents to satisfy the Owner's operational needs. Commissioning begins prior to the design phase and is continuous through the life of the facility.
 4. "Equipment" or "Systems" – Collectively or separately these are part of the Work consisting of materials, systems, components, and assemblies intended or designed to be part of the building and include any labor or process required by the Contract Documents related to that part.
 5. "Contractor's Equipment" – All or any apparatus, machinery, equipment, vehicles, materials, plant tools and all other items required for the Work, design services,

- procurement activities, or the remedying of defects but not to become part of the finished Work.
6. “Contractor Start-up” – The original check by the contractor and/or manufacturer’s representative of the installation and operation of a component or system. This is often completed with the aid of checklists provided by the installing contractor or manufacturer.
 7. “Corrective Action” – An activity intended to correct a non-conforming item or action, or to prevent further recurrences of non-conformities.
 8. “Functional Performance Testing” – Tests to confirm the proper operation of a fully installed system for operation. Tests verify operation both individually and in conjunction with other systems.
 9. “Inspection” – Any activity taken in accordance with project documents to formally or officially view, examine, measure, test, or gauge one or more characteristics of an approved material, procedure, product, or service against the specified requirements.
 10. “Material Test Certificate” – An approved test result document from either the source of materials or directly from the manufacturer or an independent agency.
 11. “Non-Destructive Test” means any test whereby the integrity or conformity of a material item can be assessed without resorting to a destructive procedure for analysis.
 12. “Owners Project Requirements” (OPR) – A document developed by the Owner design team that details all assumptions made during the creation of the construction documents to meet the Owner Requirements.
 13. “Pre-Functional Checklist (Construction Checklist)” – On-site verification of the existence and installation of equipment, materials, and or systems as required in the contract documents. The checklists serve as written notification from the contractor to the CxA that the related piece of equipment is ready for functional testing.
 14. “Review” – Verification of documents, reports, work, or any item submitted for approval in accordance with Technical Specifications Schedule 6 [Review Procedure] as called for in the Contract or as Owner's Representative may require.
 15. “Sampling Rate” – The percentage or quantity of components, equipment, or systems that will be witnessed by the Owner and or Commissioning Authority to ensure compliance with the Owner’s Project Requirements and contract documents.
 16. “Short-Term Diagnostic Testing” – The use of short term or temporary testing to verifying system operation through sampling a systems ability to perform as designed.
 17. “Third Party Inspection” – A service provided by a recognized independent agency employed by the Owner or project team to oversee inspections and tests of materials, as required by the customer or his representative.
 18. “Witness” – The authorized and/or nominated personnel from the Subcontractor, Contractor, Owner, Third Party Inspector, or vendor representative who observes or participates in the inspection and/or testing of an item to determine acceptability, in accordance with the Accepted and Endorsed Inspection & Test Procedure (ITP).

B. The following is a list of abbreviations:

1. BOD: Basis of Design
2. CM: Construction Manager
3. CxA: Commissioning Authority
4. Cx: Commissioning
5. EOR: Engineer of Record
6. FPT: Functional Performance Test
7. FTS: Functional (Performance) Test Script

8. O&M: Operations and Maintenance
 9. OPR: Owner's Project Requirements
 10. PFC: Pre-Functional Checklist
 11. SOR: Site Observation Report
 12. TAB: Testing, Adjusting, and Balancing
 13. TS: Technical Specifications
- 1.5 REFERENCE STANDARDS: The referenced sections of the following publications form a part of these Specifications; comply with provisions of these publications except as otherwise indicated or specified:
- A. ASHRAE Guideline 0 and Guideline 1
 - B. Green Building Design and Construction; LEED Reference Guide for Green Building Design and Construction, published by the U.S. Green Building Council.
- 1.6 COMMISSIONING AUTHORITY (CxA)
- A. The commissioning authority and/or agency will be selected and employed by the building owner. The commissioning authority shall not be associated with or employed by the Architect, the CM, or a sub-contractor
 - B. The Commissioning Authority for this project is dbHMS.
 - C. The CxA will create the following deliverables:
 1. A Commissioning Plan
 2. Pre-functional Checklists for specific systems and equipment
 3. Function Performance Test Procedures for specific systems and equipment.
 4. Issues Log in on-line or other form
 5. Final Commissioning Report
 - D. The primary role of the CxA is to write a commissioning plan and coordinate the execution of it. In doing so the CxA will observe and document equipment installation and performance and note when systems are not functioning in accordance with the OPR and Contract Documents.
 - E. The CxA is not responsible for design concepts, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management.
 - F. The CxA may assist with problem solving, non-conformance or deficiencies, but ultimately the responsibility to clarify the design intent lies with the EOR. The responsibility to solve deficiencies or non-conformance with the Contract Documents resides with the CM.
 - G. The CxA shall attend and record results for up to two (2) FPTs for any given system or piece of equipment. The cost for the CxA's time for attending and recording results for tests beyond two tests shall be charged to the CM by Change Order when those costs meet the criteria set forth in Part 3 of this specification under "Cost of Re-testing".

H. Limits to the responsibility of the CxA:

1. Nothing stated in this section shall be construed to transfer responsibility for the design of the building to the CxA nor to relieve the EOR of responsibility for the design.
2. Nothing stated in this section shall be construed to relieve the Construction Manager of responsibility for the means and methods of construction, scheduling and coordination of construction activities, and on-the-job safety.

1.7 COMMISSIONING PLAN:

- A. The commissioning plan is prepared by CxA and expands and makes more specific the information contained here. The commissioning plan is issued by the CxA prior to or at the Kickoff Meeting. Contractor and sub-contractors shall comply with the provisions of the Commissioning Plan. In the event of a conflict between the Commissioning Plan and these specifications, the Specifications shall govern.
- B. Schedule dates provided in the Commissioning Plan are tentative and shall be confirmed by the Construction Manager and the responsible sub-contractors by inclusion in the project master schedule.

1.8 SUBMITTALS

- A. Comply with the Division One Submittals section of these specifications.
- B. Obtain from the CxA a list of submittals required by the CxA for review.
- C. Maintain a submittal log and copy the CxA on the log at least once every two weeks.
- D. Provide submittals that are specific to this Work and that are marked to show actual materials, methods, options, dimensions, formulas, and other characteristics to be provided. "Generic" web-based PDF files without the appropriate marks and un-edited sales brochures, etc. will be returned by the CxA with the recommendation that they be rejected.
- E. Ensure concurrent submittals for related equipment; that is, equipment that relies on controls or interaction with other equipment shall be submitted for review at the same time as that equipment. In that way, the CxA and the EOR can review each component while having access to information for related systems.
- F. For re-submittals comply with the following. (Re-Submittals that do not comply will be returned by the CxA with the recommendation that they be rejected.):
 1. "Bubble" or "cloud" all changes from the previous submittal to clearly indicate what has changed.
 2. Keep all sheet numbers the same.
 3. It is permitted to omit sheets that have not changed but do not re-number sheets.
 4. Keep all drawings, schedules, and detail numbers the same.
 5. Keep all drawings and details on the same sheet as they were originally issued.

- G. Submit installation instructions and maintenance manuals. (These can inform the installation and performance of systems and are necessary for the CxA to get a complete picture.)
- H. The CxA will review submittals related to the commissioned systems only, and only with regard to the following aspects:
 - 1. Conformance to the contract Documents as they relate to the commissioning process.
 - 2. The functional performance of the systems as they relate to the OPR.
 - 3. The adequacy of the components and arrangements for developing test procedures for the commissioning process.
- I. The review by the CxA of submittals is intended only to aid in verifying compliance with the OPR and for the development of functional testing procedures. The review by the CxA does not verify compliance with the EOR's design intent, the specifications, or Contract Documents. The CxA will not stamp, sign or return hard copies of submittals but will mark submittals showing any items missing, any issues found, or areas that are not adequate for commission purposes and which require resubmission and will return electronic copies through the established channels.
- J. Submit Installation Instructions and O & M manuals for the commissioned components within 60 days of their acceptance by the EOR, not at the end of the project. (These are necessary for system commissioning) Provide the following:
 - 1. Full warranty information, including clear identification of the Owner's responsibilities to keep the warranty in force.
 - 2. The installation instructions and safety sheets that are shipped with the equipment or systems.
 - 3. O&M manual requirements for Cx do not replace O&M manual documentation requirements listed elsewhere in these specifications.

PART 2 - EQUIPMENT

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested.
- B. Special equipment, tools and instruments (only available from the vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the Owner's Project Requirements document. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have resolution of 0.1 degrees F and calibration within 6 months of use to an accuracy of ± 0.5 degrees F. Pressure sensors shall have been calibrated within 6 months of use to an accuracy of $\pm 3.0\%$ of the value being measured (not full range of device).

1. All calibration shall be to NIST traceable standards. (National Institute of Standards and Technology - www.nist.gov, 301-975-6478).
 2. All equipment shall be calibrated according to the manufacturer's recommended intervals and immediately after being dropped or damaged.
 3. Calibration tags shall be affixed or certificates readily available.
- D. Access to the buildings Wi-Fi connection for functional testing and documentation download/upload (if available).

2.2 EQUIPMENT FOR ACCESS

- A. Provide means for the CxA to access, observe, touch, and visually confirm proper operation of all equipment and systems. These means shall follow all OSHA and job-site safety regulations.

PART 3 - EXECUTION

3.1 GENERAL

- A. Execute the Work of this section and allocate work to CM, sub-contractors, and suppliers as appropriate and at the discretion of the CM, understanding that ultimate responsibility lies with the CM.
- B. Provide coordination between all construction and supply entities to provide a complete and functional commissioning as required here and in conformance with the referenced standards.
- C. Any References to "sub-contractor" or "supplier" responsibilities are for convenience in dividing and organizing language and are not intended to allocate Work and shall not remove ultimate responsibility from the CM.

3.2 SCHEDULING COMMISSIONING

- A. Maintain a master project schedule as specified in other Division One sections and ensure, in coordination with the Cx Plan and CxA, that Cx activities are included in detail. Inform the CxA of discrepancies between the project schedule and the Cx Plan.
- B. Integrate all commissioning activities into the master schedule. Obtain sufficient notice of schedule changes from the CxA to update the commissioning activities schedule.
- C. At least once a month, publish an overall project schedule with the commissioning milestones included.
1. Ensure that the schedule includes the steps that must proceed and follow the system installation.
 2. Ensure that all systems tests are included in the schedule.

- D. Notify the CxA when commissioning activities, not yet performed or scheduled, will delay construction.
- E. Inform the CxA in writing on a weekly basis of the status of activities that affect the commissioning process; this may be accomplished by copying the CxA on job meeting minutes – provided they have the necessary detail.

3.3 RESPONSIBILITIES

A. Construction Manager (CM)

- 1. Include the cost of commissioning in the contract price.
- 2. Ensure that sub-contractors perform their commissioning responsibilities.
- 3. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings, related to commissioned equipment, to the CxA.
- 4. Attend commissioning meetings as required by the CxA.
- 5. In each purchase order or subcontract written, include the requirements for submittal data, O&M data, commissioning tasks and training.
- 6. Responsible for ensuring that all Subcontractors, suppliers, and manufacturers execute their commissioning responsibilities, according to the Contract Documents and schedule.
- 7. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
- 8. Submit O&M manuals to the CxA for review **within 60 days** of acceptance of equipment submittals by EOR.
- 9. Designate a representative who shall attend a commissioning kickoff meeting and other necessary meetings scheduled by the CxA to facilitate the Commissioning process.
- 10. Verify that Test and Balance has been completed in accordance with Division 23 specifications and submit a test and balance report to the EOR and CxA for review.
- 11. Coordinate the training of Owner operations and User personnel.

Warranty Period

- 12. Ensure that Subs correct items of non-compliance and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing or the 10-month review, and as noted by LEED criteria.

Change Orders for Commissioning Costs

- 13. Prepare a deduct Change Order to the Owner for the cost incurred by the CxA for attending and recording results of field testing when those costs meet the criteria set forth in Part 3 of this specification under “Cost of Re-testing”.

B. Sub-Contractors

- 1. The commissioning responsibilities applicable to each of the subcontractors are generally as follows (all references apply to commissioned equipment only). Specific requirements may be shown in the appropriate Divisions.
- 2. Construction and Acceptance Phases
 - a. Include the cost of commissioning work in the contract price.
 - b. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data, and training.

- c. Attend a commissioning kickoff meeting and other meetings necessary to facilitate the Commissioning process.
- d. Subcontractors shall provide the CM with shop submittals of commissioned equipment, as part of the normal submittal process, for distribution to the CxA as specified in Part 1 of this section.
- e. Deliver O & M manuals within 60 days of acceptance of equipment by the EOR in accordance with the submittal requirements in Part 1 of this section.
- f. Provide further documentation necessary for the commissioning process when requested by the CxA.
- g. Subcontractors shall assist, along with the EOR, in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation are not sufficient for writing detailed testing procedures.
- h. Assist the CxA in preparing the specific functional performance test procedures.
- i. Review test procedures prepared by the CxA to ensure feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests.
- j. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists from the CxA for all commissioned equipment. Submit the plan to CxA for review prior to startup.
- k. During the startup and initial checkout process, execute the pre-functional checklists for all commissioned equipment. Submit Construction (Pre-functional) checklists a minimum of five days prior to the start of functional performance testing. Note: If for whatever reason, Pre-functional checklists are not complete, written verification that equipment is ready for functional performance testing is required.
- l. Perform and clearly document the completed startup and system operational checkout procedures, providing a copy to the CxA.
- m. Address current A/E punch list items before functional testing.
- n. Provide skilled technicians to execute starting the equipment and to execute the functional performance tests. Ensure that the individuals are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.
- o. Provide all tools or the use of tools to start, checkout and functionally test equipment and systems, except for testing equipment supplied and installed by the CxA.
- p. Perform functional performance testing under the direction of the CxA for specified equipment. Assist the CxA in interpreting the monitoring data, as necessary.
- q. Correct deficiencies, differences between specified, and observed performance, as reported by the CxA to the A/E and as directed by the Owner's representative. Retest the equipment.
- r. Update O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions. Submit a copy of the complete O&M manual to the CxA for review and approval prior to the final submission to the owner.
- s. Prepare redline as-built drawings for all design drawings and final as-builds for contractor-generated coordination drawings.

- t. Prepare a training outline and submit to CxA for comment and approval as described in division 01. Provide training of the Owner's operating personnel as specified in division 01.
 - u. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
3. Warranty Period
- a. Execute seasonal or deferred functional performance testing, witnessed by the CxA, when specified as part of the commissioning process or called for in the Commissioning Plan.
 - b. Correct issues of non-compliance and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
- C. Equipment Suppliers
- 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 - 2. Assist in equipment testing per agreements with Subs.
 - 3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CxA.
 - 4. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
 - 5. Review test procedures provided by factory representatives and deliver to CxA.
 - 6. Deliver factory representative test result reports to the CxA.

3.4 TEST AND BALANCE VERIFICATION

- A. Provide the labor and test equipment necessary to demonstrate to the CxA that the air and water systems have been properly balanced. This is required prior to the start of functional performance testing of balanced equipment.
- B. The CxA will randomly select devices, equipment and systems for verification purposes.
- C. The CM shall regard this verification process as a functional performance test for purposes of time allowed to correct deficiencies and requirements regarding retesting if major problems are discovered.

3.5 START-UP AND PRE-FUNCTIONAL CHECK LISTS

- A. Prepare a start-up plan for each piece of equipment including the following:
 - 1. The manufacturer's standard start-up and check out procedures copied from the installation instructions.
 - 2. The subcontractor's standard start-up and check out procedures.
 - 3. Construction (Pre-functional) checklists provided by the CxA.
 - 4. Checklists and procedures with specific spaces for recording and documenting the inspection of each procedure and a summary block for deficiencies and explanations.
- B. Submit startup plan to CxA for review and obtain approval before proceeding. Include final startup report signature block provided by CxA.
- C. Incorporate this equipment start-up date in overall start-up schedule for the project.
- D. Perform start-up testing for each piece of equipment to ensure that the equipment and systems are properly installed and ready for turnover to the Owner.
- E. The CxA and/or Owner may be present for the start-up of the equipment. For lower-level components of equipment or for similar equipment present in large quantities, the CxA may observe a sampling of the pre-functional and start-up procedures. The sampling procedures are identified in the commissioning plan.
- F. Identify individuals that have direct knowledge of, and have witnessed, that a line item task on the pre-functional checklist was actually performed. Ensure that these individuals, and only these individuals, are the ones to initial or check-off that item on the pre-functional checklist.
- G. Ensure that start-up and pre-functional checklists are completed on the job-site concurrent with the activities being documented. Checklists that are found to have undergone remedial documentation either off-site or after the procedures have been completed will be rejected by the CxA.
- H. Ensure that checklists are complete, accurate, and fully legible to the CxA's satisfaction.
- I. Where checklists are rejected by the CxA due to non-compliance with "G" and "H" above, repeat the procedure or test and prepare new checklists at no additional cost to the Owner.
- J. Submit the completed start-up checklists, reports and equipment pre-functional checklists to the CxA for review. Note all noncompliance items on these checklists. Notify the CxA when outstanding items have been corrected.
- K. Submit satisfactory completed start-up checklists to the CxA a minimum of five working days prior to the start of functional performance testing.

3.6 FUNCTIONAL TESTING PREPARATION

- A. CM's signature on the final start-up checklists signature block shall constitute certification by the CM that:
1. The commissioned systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
 2. The commissioned instrumentation and control systems have been completed and calibrated, are operating according to the Contract Documents, and pretest set points have been recorded.
 3. Testing, adjusting, and balancing procedures have been completed and reports of same have been submitted, discrepancies corrected, and corrective work approved.
 4. CM agrees to a deduct change order as follows:
 - a. In the event that the CxA arrives on site and determines that equipment and systems are not in the condition certified, the CxA shall inform the Owner of a wasted trip and provide an itemized list of expenses associated with the trip. The Owner shall prepare a deduct Change Order to the Contract for costs incurred by the CxA and execute it under the provisions of other Division One sections.
 5. CM agrees to commencement of procedures listed below under "Cost of Retesting"

3.7 FUNCTIONAL PERFORMANCE TESTING

- A. Provide all documentation as requested to the CxA for development of functional performance testing procedures. This documentation shall include, at a minimum, manufacturer's installation, start-up, operation and maintenance procedures. The CxA may request further documentation as necessary for the development of functional performance tests.
- B. Review the functional performance test scripts developed by the CxA.
1. Respond in writing to the CxA regarding the acceptability of the proposed test scripts.
 2. Note any necessary modifications to the scripts due to the actual equipment/systems or safety concerns and submit these to the CxA for consideration.
- C. Place equipment and systems into operation and continue the operation as required during each working day of the testing activities.
- D. Accomplish the functional performance testing of equipment based on scripts developed by the CxA and as reviewed by the CM.
1. Provide access to the equipment in compliance with OSHA regulations.
 2. Provide, to the CxA, access to The Building Automation System by way of passwords, web-based access, and access on site via temporary or permanent front-end computer and equipment.
 3. Provide skilled technicians to operate the systems during functional performance testing. The CxA reserves the right to determine if the technician is not suitable for testing and has the authority to request a more experienced technician.
 4. Correct any deficiencies identified during testing and retest equipment as required.

5. For lower-level components of equipment or for similar equipment present in large quantities, the CxA may perform functional testing of a sampling of equipment. The sampling procedures are identified in the commissioning plan.
- E. Functional performance testing is intended to begin upon completion and proper startup (dictated by the manufacturer) of a system. Functional testing may proceed prior to the completion of the system at the discretion of the CxA only.
- F. Verify all sequences of operation defined in the Contract Documents for the commissioned equipment and systems.
 1. Perform testing by overriding set points or sensor readings at the DDC System or by other means mutually agreed to by the Contractor, the CxA and the owner, to initiate sequences of operation and verifying the response of the system.
- G. Upon successful completion of all functional performance tests, perform Integrated Systems Testing. The testing shall document and verify the proper response of the overall HVAC systems.
- H. Provide technicians, instrumentation, and tools to perform commissioning tests at the direction of the CxA.
- I. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.
- J. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- K. The CxA along with the Contractors, testing and balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- L. Tests will be performed using design conditions whenever possible.
- M. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- N. The CxA may direct that set points be altered when simulating conditions is not practical.
- O. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

- P. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- Q. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.8 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

- A. Documentation. The CxA shall witness and document the results of functional tests using the specific Functional Test Scripts (FTS) developed for that purpose. Prior to testing, these scripts are provided to the CM for review and approval and to the Subs for review. The CxA will include the filled-out scripts in the Commissioning Report.
- B. Non-Conformance.
 - 1. The CxA will record the results of the functional test on the FTS form. All issues of non-conformance shall be noted.
 - 2. Corrections of minor issues of non-conformance identified may be made during the tests at the discretion of the CxA. In such cases the issues of non-conformance and resolution will be documented on the FTS form.
 - 3. Make every effort to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
 - 4. As tests progress and non-conformance issues are identified, the CxA will discuss and log issues.
 - a. When there is no dispute on the non-conformance issue and the Sub accepts responsibility to correct it:
 - 1) The CxA documents the deficiency and the Sub's response and intentions, then go on to another test or sequence.
 - b. If there is a dispute about a non-conformance issue, regarding whether it is a non-conformance issue or who is responsible:
 - 1) The non-conformance issue shall be documented as an issue and assigned to an assumed responsible party.
 - 2) Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
 - 3) The CxA documents the resolution process in the Issues Log.
 - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and provides a written response in the Issues Log documenting the resolution. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
 - 5. Provide written response to each issue recorded in the Issue Log provided by the CxA. Update these responses at least as often as commissioning meetings are scheduled. Outline the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

6. The CxA retains the original FTS forms until the end of the project.
- C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable. In such case, the CM shall provide the Owner with the following:
1. Within one week of notification, the CM or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided within two weeks of the original notice.
 2. Within two weeks of the original notification, the CM or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly differ from the specification requirements of the original installation.
 3. The Owner will determine whether a replacement of all identical units or a repair is acceptable.
 4. Upon acceptance, the CM and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- D. Approval. The CxA notes each satisfactorily demonstrated function and recommends acceptance of each test on the FTS form. The Owner gives final approval on each test using the same form, providing a signed copy to the CxA and the Contractor.

3.9 TRACKING OF ISSUES – ISSUES LOG

- A. The CxA will create and maintain a log of issues related to the building systems in an on-line web site or other means that allows all members of the team to:
1. View the issues and related photos and documents
 2. Read any responses
 3. Write responses when the issue is assigned to them
- B. All issues will be assigned to a member (or members) of the team by the CxA in a way that will allow them to respond in writing to the issue and provide photos and documents as part of their response.
- C. For those issues assigned to the CM, sub-contractor or supplier:
1. Respond in writing to the issue, as a minimum, within 10 working days of its published date or the date of any subsequent comment by the CxA.
 2. If work on resolving an issue is in progress, indicate this in writing.
 3. Ensure the sub-contractors provide information required to solve the issue.

- D. Periodically, all issues open and not responded to within 10 working days will be submitted to the Owner as delinquent. The CxA reserves sole discretion in determining the status of issues, e.g. “open”, “ready for verification”, or “closed”.
- E. The Owner may increase the retainage percentage for sub-contractors with an unacceptable number of open issues where written responses are not up to date.
- F. The final Cx Report will contain a copy of the issues log identifying the status of all issues.

3.10 COST OF RETESTING

- A. The cost for the Subcontractor to retest a pre-functional or functional test, if they are responsible for the non-conformance issue, shall be theirs.
- B. First two functional tests: The CxA shall attend and record results for up to two (2) functional tests for any given piece of equipment as part of the CxA’s normal scope.
- C. Beyond two tests: The cost for the CxA’s time for attending and recording results for tests beyond two tests shall be charged to the Construction Manager by Change Order when:
 - 1. The deficiency is due to deficient work by responsible contractors and
 - 2. That work has been recorded as deficient by the CxA and
 - 3. That work remains uncorrected, or the contractor has failed to adequately respond to commissioning comments after the first two tests.

3.11 OPERATION AND MAINTENANCE (O&M) MANUALS

- A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.
- B. Each Division shall compile and prepare documentation for all equipment and systems covered in that Division and deliver this documentation to the CM for inclusion in the O&M manuals.
 - 1. Field checkout sheets and logs should be provided to the CxA.
 - 2. All documentation shall be made specific to this project by permanently marking “generic” manufacturer’s O&M manuals to indicate exactly which models and options are included in the Work of this project.
- C. Deliver the O&M manuals to the CxA for review within 60 days of final review of the submittals of the equipment.
- D. Review and Approvals. Review of the commissioning-related sections of the O&M manuals shall be made by the A/E and by the CxA.

3.12 TRAINING OF OWNER PERSONNEL

- A. Coordinate and schedule training and ensure that training is completed.

- B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
- C. Prepare a training outline and submit to CxA for comment and approval. Provide training of the Owner's operating personnel.

3.13 DEFERRED FUNCTIONAL PERFORMANCE TESTING

- A. Perform any deferred testing as required to properly demonstrate successful operation to the owner.
 - 1. Some test conditions may not be able to be simulated and thus require the actual conditions to be present, to implement and test.
 - 2. A mutually convenient time to owner, CxA, and Contractor will be scheduled when these test conditions will be present, to conduct this deferred testing.
 - 3. Perform these tests as indicated in the functional performance test procedures.
- B. Correct any deficiencies or failures identified in the process of performing these tests.

END OF SECTION

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SECTION 02 4113 - SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes site demolition as indicated on the drawings and required for installation of new work required for completion of the project and as specified.

1.2 DEFINITIONS

- A. Remove and Dispose: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, where indicated, and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

- A. Schedule of Site Demolition Activities: Indicate the following:
 - 1. For purposes of Owner's information only, sequence of site demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
- B. Inventory: After site demolition is complete, submit a list of items that have been removed and salvaged.
- C. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by site demolition operations.

1.4 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning site demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.5 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with site demolition.
- C. Hazardous Materials: Start operation under this section only after hazardous materials have been removed in accordance with related sections.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and the Owner.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities required to remain in service and protect them against damage during site demolition operations. Maintain fire-protection facilities in service during site demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of site demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and preconstruction videotapes.
 - 1. Before site demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

- E. Perform surveys as the Work progresses to detect hazards resulting from site demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during site demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be demolished.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct site demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3.4 SITE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during site demolition. Items may be removed to a suitable, protected storage location during

site demolition and cleaned and reinstalled in their original locations after site demolition operations are complete.

3.5 SITE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 MANAGEMENT OF DEMOLISHED MATERIALS

- A. Separate recyclable demolished materials from other demolished materials to the maximum extent possible. Separate recyclable materials by type.
 - 1. Provide containers or other storage method for controlling recyclable materials until they are removed from Project site.
 - 2. Stockpile processed material on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from demolition area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Transport demolished materials off Owner's property and legally dispose of all materials in accordance with authorities having jurisdiction.
- B. Remove from the site and legally dispose of non-recyclable debris, rubbish, and other materials resulting from demolition operations in accordance with authorities having jurisdiction.
- C. Comply with requirements specified in Division 1 Section "Construction Waste Management."
- D. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by site demolition operations. Return adjacent areas to condition existing before site demolition operations began.

END OF SECTION

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.
4. Salvaging items for reuse by Owner.

- B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for noise control and dust control.
 - 6. Review procedures for protection of adjacent buildings.
 - 7. Review items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping or re-routing of utility services.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.9 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Lead-Based Paint: Implement engineering control measures prior to demolition activities to minimize generation of dust and exposure to lead.

1.10 COORDINATION

- A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.

- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Protect items from damage during transport and storage.
 - 5. Deliver items to Owner.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
 - 1. Comply with requirements in Section 01 1050 "Existing Utility Procedures".
 - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 3. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
 - 4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least <Insert number> hours after flame-cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Salvage: Items to be removed and salvaged are indicated below:
1. Door latch sets and locks.
- D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- E. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.7 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.10 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Base Bid:
 - 1. General Contractor
 - a. Footings.
 - b. Foundation Walls.
 - c. Grade Beams, Tie Beams
 - g. Slab-on-grade.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 00 - Procurement and Contracting Requirements.
 - 2. Division 01 - General Requirements.
- C. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete,"
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures

- H. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and re-shoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other Pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements

1.4 SUBMITTALS

- A. See Section 01 33 23 for requirements for the mechanics and administration of the submittal process.
- B. Product Data: For each type of product indicated.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. Mix designs must be prepared or reviewed by an approved independent testing agency retained by the Contractor in accordance with requirements of ACI 301 and ACI 318 and must be coordinated with design requirements and Contract Documents.
 2. Before submitting to Testing Agency, submit complete mix design data for each separate mix to be used on the Project in a single submittal.
 3. Mix materials must be from the same production facility that will be used for this Project.
 4. Mix Design data must include but not be limited to the following:
 - a. Locations on the Project where each mix design is to be used corresponding to Structural General Notes on the Drawings.
 - b. Design Compressive Strength: As indicated on the Drawings.
 - c. Proportions: ACI 301 and ACI 318.
 - d. Gradation and quality of each type of ingredient including fresh (wet) unit weight, aggregates sieve analysis.
 - e. Water/cementitious material ratio.
 - f. Evaluation and classification fly ash in accordance with ASTM D 5759.
 - g. Report of chemical analysis of fly ash in accordance with ASTM C 618.
 - h. Classification of slag cement in accordance with ASTM C 989.

- i. Slump: ASTM C 143.
 - j. Air content of freshly mixed concrete by the pressure method, ASTM C 231, or the volumetric method, ASTM C 173.
 - k. Density of Concrete: ASTM C 138.
 - l. Design strength at 28 days, as indicated on Contract Documents: ASTM C 39.
 - m. Document strength based on basis of previous field experience or trial mixtures per ACI 301. Proportioning by water-cement ratio alone, with no test results per the trial mixtures procedure is not permitted.
 - n. Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard deviation calculation, and determination of required average compressive strength. Test records to support proposed mixtures must be no more than 24 months old and use current cement aggregate sources. Test records to establish standard deviation may be older if necessary to have the required number of samples.
 - o. If early concrete strengths are required, Contractor must submit trial mixture results as required.
 - p. Manufacturer's product data for each type of admixture.
 - q. Manufacturer's certification that all admixtures used are compatible with each other.
 - r. Normalweight Concrete: Density per ASTM C 138. Design the mix to produce the strength, modulus of elasticity and density as indicated on the Contract Documents.
 - s. Certification from a qualified testing agency indicating absence of potential for deleterious expansion of concrete due to alkali reactivity of the aggregate as determined by testing per ASTM C1260 in accordance with ASTM C 33. If potential for deleterious expansion exists, expansion reduction and mitigation measures per the guidelines of ASTM C1778 or US Army COE CRD-C662 must be submitted for review by the SER.
 - t. Indicate amounts of mixing water to be withheld for later addition at Project site.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified Structural Engineer licensed in the state of Illinois detailing fabrication, assembly, and support of formwork.
1. Shoring: Indicate proposed schedule and sequence of stripping formwork and shoring removal.
- F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.
- G. Installer's Qualification Data.
- H. Shop Drawings:
1. Plans and elevations showing location and dimension of components.
 2. Details of connections, design elements, and relation to adjacent items.
- I. Welding certificates.

- J. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semi-rigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
 - K. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
 - L. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
 - M. Submit for action layout of embedded conduit and pipes.
 - N. Field quality-control reports.
 - O. Minutes of pre-installation conference.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Forms for Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp-proofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or Type II gray. Supplement with the following:

- a. Fly Ash: ASTM C 618, Class F or C.
 - b. Use one brand of fly ash throughout project unless otherwise acceptable to the Architect.
 - c. Do not use fly ash for exposed surfaces.
 - d. Concrete to be placed in cold weather as defined herein: No fly ash allowed unless the cold weather procedure submitted has compensated for the increased setting time and decreased rate of strength gain due to cold weather and fly ash.
2. Blended Hydraulic Cement:
- a. ASTM C595, Type 1L, Portland-Limestone Cement
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. The acceptability of aggregates for the work will depend on proof that their potential alkali reactivity is not deleterious to the concrete.
- C. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
- D. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- E. Water: ASTM C 94 and potable.
- F. Supplementary Cementitious Material
1. Fly Ash: ASTM C 618, Class C or Class F.
 2. Slag Cement: ASTM C 989.
 3. Silica Fume (Microsilica): ASTM C1240.
 - a. Acceptable Products:
 1. Force 10,000 D by GCP Applied Technologies, Inc.
 2. Eucon MSA by Euclid Chemical Company
 3. MasterLife SF 100 by BASF Corporation
 4. Sikacrete 950 DP by Sika Corporation

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.6 WATERSTOPS

- A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. SIKA Hydrotite by SIKA.
 - b. Expand-Tite by DuraJoint Waterstop
 - c. Earth Shield Type 20 by J P Specialties, Inc.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, 15 mil. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
 - b. Fortifiber Building Systems Group; Moistop Ultra.
 - c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - d. Insulation Solutions, Inc.; Viper VaporCheck .
 - e. Meadows, W. R., Inc.; Perminator.

2.8 FLOOR AND SLAB TREATMENTS

- A. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of Portland cement, graded quartz aggregate, and plasticizing admixture.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Maximent.
 - b. ChemMasters; ConColor.
 - c. Conspec by Dayton Superior; Conshake 500.
 - d. Dayton Superior Corporation; Quartz Tuff
 - e. Euclid Chemical Company (The), an RPM company; Surfex.

2.9 CURING MATERIALS

- A. Interaction with finishes:
 1. See architectural Drawings for finish material applied over concrete.
 2. Use only curing and sealer compounds that are compatible with finish, waterproofing or roofing material
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. ChemMasters; SprayFilm.
 - c. Conspec by Dayton Superior; Aquafilm.
 - d. Edoco by Dayton Superior; BurkeFilm.
 - e. Euclid Chemical Company (The), an RPM company; Eucobar.
 - f. Sika Corporation; SikaFilm.
 - g. SpecChem, LLC; Spec Film.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- E. Water: Potable.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Kure 200.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Conspec by Dayton Superior; W.B. Resin Cure.
 - d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - e. Edoco by Dayton Superior; Res X Cure WB.
 - f. Meadows, W. R., Inc.; 1100-CLEAR.

2.10 DRY SHAKE HARDENERS

- A. Mineral Aggregate Hardener:
 - 1. The specified mineral aggregate hardener must be a factory-blended mixture of specially processed graded non-metallic aggregate.
 - 2. Acceptable Products:
 - a. Euclid Chemical Company, "Surflex" to be used with "Kurez DR VOX"
 - b. MasterTop 100 to be used with "MasterKure CC 200WB by BASF Corporation
 - c. Quartzplate FF to be used with Dress & Seal WB 30 by Laticrete International, Inc.
- B. Non-Oxidizing Metallic Hardener:
 - 1. The specified non-oxidizing metallic floor hardener must be a mixture of specially processed non-rusting aggregates.
 - 2. Acceptable Products:
 - a. Euclid Chemical Company, "Diamond-Plate" to be used with "Kurez DR VOX"
 - b. MasterTop 210COR to be used with "MasterKure CC 200WB by BASF Corporation
 - c. Emeryplate FF to be used with Lumiseal WB by Laticrete International, Inc.

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris

2.12 CONCRETE REPAIR MATERIALS

- A. Polymer-Modified Repair Mortar: The following patching mortars may be used when color match of the adjacent concrete is not required. Prior approval by the Design Professionals is required.

1. Acceptable Products-Horizontal Surfaces:
 - a. Tammspatch II or Tamms Thin Patch by Euclid Chemical Company
 - b. Sikatop 122 Plus by Sika Corporation
 - c. Meadow-Patch T1 or T2 or Meadow-Crete GPS by W. R. Meadows
 - d. Duracrete by Laticrete International, Inc.
2. Acceptable Products-Vertical and Overhead Surfaces:
 - a. MasterEmaco N400 by BASF Cor Polymer-Modified Repair Mortar
 - b. Verticoat, Vertacoat Supreme or Dualtop Gel by Euclid Chemical Company
 - c. SikaTop 123 Plus by Sika Corporation
 - d. Meadow-Crete GPS by W. R. Meadows
- B. Crack Repair:
 - a. Euco Qwikstitch or Dural 50 LM by Euclid Chemical Company
 - b. MasterSeal 630 by BASF Corporation
 - c. T78 Methyl Methacrylate Crack Sealer by Transpo Industries, Inc.
- C. Epoxy Injection:
 1. ASTM C881
 2. Acceptable Products:
 - a. MasterInject 1380 by BASF Corporation
 - b. Dural Injection Gel by Euclid Chemical Company
 - c. Sikadur 35 LV LPL by Sika Corporation
 - d. Rezi-Weld LV State by W. R. Meadows
- D. Semi Rigid Joint Filler:
 1. Acceptable Products:
 - a. MasterSeal CR 190 by BASF Corporation
 - b. Euco 700 or Qwikjoint UVR by Euclid Chemical Company
 - c. MM-80 by Metzger/McGuire
 - d. Rezi-Weld Flex by W. R. Meadows
- E. Sealant:
 1. Silicone or Polyurethane Sealant (as selected based on project requirements such as loading, traffic, bond, coatings, etc.).
 2. Joint to be routed and cleaned per manufacturer's written directions.
 3. Acceptable Products:
 - a. MasterSeal Sealants by BASF Corporation
 - b. Sikaflex-1C SL and Loadflex 524 EZ by Sika Corporation
 - c. Pourthane NS by W. R. Meadows
 - d. Eucolastic INS by Euclid Chemical Company
- F. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (and that can be feathered at edges to match adjacent floor elevations).
 1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C 109/C 109M.
- G. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C 109/C 109M

2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: For concrete assigned to Exposure Classes F1 and F2, as defined in ACI 318, there is no limit to the maximum amount of supplementary cementitious materials included in the mix as a percentage of total cementitious materials by mass.
- C. The total water-soluble chloride ion content of the mix including all constituents must not exceed the limits defined in ACI 318 corrosion protection of reinforcement.
- D. Admixtures: Use admixtures according to manufacturer's published instructions.
- E. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
- F. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- G. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.14 CONCRETE MIX DESIGN

- A. Concrete Strength:
 1. Must be as indicated on the Structural Drawings including Exposure Category.
 2. Where concrete strength is not indicated on the drawings, the minimum concrete strength for exposure classes as defined in ACI 318 are as follows:
 - a. F0, S0, W0, C0, C1 = 2500 psi
 - b. F1 = 3500 psi
 - c. S1, W1 = 4000 psi
 - d. F2, S2, S3, = 4500 psi
 - e. F3, C2 = 5000 psi
- B. Concrete Density (Unit Weight):
 1. Must be as indicated on the Structural Drawings

C. Air Entrainment

1. For concrete exposed to freeze/thaw cycles and/or deicing chemicals (ACI 318 Exposure Classes F1, F2, F3), and concrete intended to be watertight, provide entrained air content of $6\% \pm 1.5\%$, unless specified otherwise. This includes, but is not limited to, concrete at the following locations:
 - a. Concrete at the exterior of the structure with at least one surface exposed to weather, such as exterior face of grade beams, foundation walls and exterior walls and Tunnel walls.
2. For concrete with a specified compressive strength (f'_c) greater than 5000 psi required air content may be reduced to $5\% \pm 1.5\%$.
3. Entrained air content noted above must occur at point of delivery.
4. No entrained air content is required for foundations with no surface exposed to weather.
3. All interior steel trowel finished, normal weight slabs must have a maximum air content of 3%.

D. Water-Cementitious Material Ratio (w/cm) for Normalweight Concrete

1. The total combined weight of Portland cement and all other supplementary cementitious material must be used to determine the w/cm.
2. The w/cm must not exceed the values indicated below, including any water added to meet specified slump in accordance with the requirements of ASTM C 94.
3. Based on Exposure Class, as defined in ACI 318, the following maximum w/cm must be provided:
 - a. Exposure Class F0, S0, W0, C0, C1, no maximum
 - b. Exposure Class F1, max w/cm=0.55
 - c. Exposure Class S1, W1, max w/cm=0.50
 - d. Exposure Class F2, S2, S3, max w/cm=0.45
4. Concrete used in slab on grade must have a maximum w/cm ratio of 0.45.

E. Slump

1. Concrete design mixes must be proportioned to meet the following slump limitations:
 - a. Concrete with high range or mid-range water-reducing admixture: Concrete slump prior to addition of high range water-reducing admixture must not exceed 3" +/- 1" for normalweight concrete. After addition of water-reducing admixture, the concrete must have a maximum slump of 9" +/- 1" unless otherwise approved by the SER.

F. Concrete without a water-reducing admixture: Slump must not exceed 4" +/- 1".

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Fabricate in accordance with approved shop Drawings, ACI 315 and Contract Documents.
- C. Heating of Reinforcement: Will be permitted only with specific prior approval of the SER.
- D. Welding: Comply with ANSI/AWS D1.4; use E9018 electrodes or approved electrodes.
- E. Tolerances: Comply with ACI 117.
- F. Unacceptable Materials: Reinforcement with any of following defects will not be permitted in Work.
 1. Bar lengths, depths, and bends exceeding ACI fabrication tolerances.
 2. Bends or kinks not indicated on Drawings or final shop drawings.

3. Bars with reduced cross-section due to excessive rusting or other cause.

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch for smooth-formed finished surfaces exposed to view.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.

- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND RE-USING FORMS

- A. General: Formwork for sides of walls, columns, piers and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F 24 hours after placing concrete. Concrete must be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for slabs in the middle third of spans.
 - 4. Locate horizontal joints in walls and columns at underside of floors and slabs, and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated on the Drawings. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. For Conduits and Pipes Embedded in Concrete:

1. For concrete slab, wall, or column, conform to requirements of ACI 318. For variations from these requirements, submit a written request for Design Professionals' review and response.

2. Conduits and pipes must not be embedded in concrete slabs on steel deck without approval of Design Professional.

3. Provide sleeves for pipes passing vertically through concrete.
 4. Do not embed aluminum materials.
 5. Do not cut, bend or displace the reinforcement to facilitate placement of embedded pipes and conduits.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo or where indicated on Architectural drawings.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

- F. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.
- G. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:
 - 1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.
 - 2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
 - 3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations : Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than 28 days old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing and cracks more than 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 EVALUATION AND ACCEPTANCE OF CONCRETE

- A. In accordance with ACI 301, except where otherwise specified.
- B. If, at any time during construction, the concrete resulting from the approved mix design deviates from Specification requirements for any reason, such as lack of workability, or insufficient strength, the Contractor must have his laboratory verify the deficiency and modify the mix design, until the specified concrete is obtained. Modified mix to be submitted for approval.

3.17 CORRECTIVE MEASURES

- A. Conflicts: The Contractor must be solely responsible for errors of detailing, fabrication, and placement of reinforcement steel; placement of inserts and other embedded items; and the structural adequacy of all formwork.
- B. Compensation for Additional Services: Should additional work by Design Professionals such as design, documentation, meetings and/or site visits be required which are necessitated by failure of the Contractor to perform the work in accordance with the Contract Documents either developing corrective actions or reviewing corrective actions developed by others, the Contractor is responsible for paying for additional work performed by the Design Professionals at their standard firm-wide billing rates plus out-of-pocket expenses incurred at cost + 10%.

3.18 FIELD QAULITY CONTROL

- A. Testing and Inspecting: The Contractor will engage a qualified testing and inspecting agency to perform field tests and special inspections and prepare test reports.
- B. Special Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.

3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
- C. Refer to structural drawings for IBC Special Inspections Requirements.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.19 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

SECTION 03 35 43 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes polished concrete finishing and scoring.

1. Concrete for polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete not designated as polished concrete.

1.3 DEFINITIONS

A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.4 PREINSTALLATION MEETINGS

A. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:

1. Contractor's superintendent.
2. Cast-in-place concrete subcontractor.
3. Polished concrete finishing Subcontractor.

B. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Laboratory Test Reports: For liquid floor treatments, indicating compliance with requirements for low-emitting materials.
- C. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
- D. Samples for Initial Selection: For each type of product requiring color selection.
- E. Samples for Verification: For each type of exposed color.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 1. Repair materials.
 2. Stain materials.
 3. Liquid floor treatments.

1.7 QUALITY ASSURANCE

- A. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 2. Demonstrate curing, finishing, and protecting of polished concrete.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Floor Products; Retro Plate 99.
 - b. ARDEX Americas; PC 50 Lithium Densifier.
 - c. AWRC Corporation; AMERI-SHIELD Shield-Star.
 - d. Euclid Chemical Company (The); an RPM company; Euco Diamond Hard.
 - e. L&M Construction Chemicals, Inc; FGS Hardener Plus.
 - f. QuestMark; DiamondQuest Densifying Impregnator.
 - g. Vexcon Chemicals Inc.; Certi-Shine Clear.
 2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 POLISHING

- A. Polish: Match design reference sample.
- B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 6. Control and dispose of waste products produced by grinding and polishing operations.
 7. Neutralize and clean polished floor surfaces.

END OF SECTION 03 35 43

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Concrete masonry units.
2. Clay face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

- B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation.

- C. Related Requirements:

1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 072100 "Thermal Insulation" for cavity wall insulation.
3. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
4. Section 321400 "Unit Paving" for exterior unit masonry paving.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples: For each type and color of the following:
 - 1. Exposed CMUs.
 - 2. Clay face brick, in the form of straps of five or more bricks.
 - 3. Special brick shapes.
 - 4. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 5. Weep holes and cavity vents.
 - 6. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.
 - 6. Reinforcing bars.

7. Joint reinforcement.
 8. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 36 inches (900 mm) high by full thickness.
 2. Build sample panels facing south.
 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 4. Protect approved sample panels from the elements with weather-resistant membrane.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

- A. Regional Materials: Verify CMUs are manufactured within 100 miles (160 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.

C. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Density Classification: Medium weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 BRICK

A. Regional Materials: Verify brick is manufactured within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Clay Face Brick - Solid: Facing brick complying with ASTM C 216.

1. Grade: SW.
2. Type: FBX.
3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 8250 psi (56.88 MPa).
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
7. Application: Use at north elevation and all locations that have recessed or protruding brick.
8. Color and Texture: As selected by Architect.

D. Clay Face Brick - Hollow: hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).

1. Grade: SW.
2. Type: HBX.

3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 8250 psi (56.88 MPa).
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
7. Application: Use where brick is conventional running bond.
8. Color and Texture: As selected by Architect.

2.6 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Manufacture aggregate for mortar and grout, cement, and lime within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
- B. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Aggregate for Mortar: ASTM C 144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C 404.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

- J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- K. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Stainless steel.
 - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
 - 7. Provide in lengths of not less than 10 feet (3 m).
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
 - 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666,.
 - 7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 8. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

- C. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication, stainless steel, or as detailed on structural drawings.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- E. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication.
 - 3. Fabricate wire ties from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 - 4. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed washer head that covers hole in sheathing.

2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" and as follows:
 - 1. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 - 2. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 - 3. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
 - 4. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 - 5. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
 - 6. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
 - 7. Solder metal items at corners.
- B. Flexible Flashing: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: 32 to 36 mil (0.813 mm to 0.915mm) thick self-adhesive rubberized asphalt integrally bonded to cross-laminated, high-density polyethylene film of 4 to 8 mil (0.1mm to 0.2 mm) thickness, for a total minimum thickness of 40 mils (1 mm). Provide a stainless steel drip edge with hemmed edge.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide GCP Applied Technologies Inc.; “W.R. Grace Perm-A-Barrier” or a comparable product by one of the following:
 - 1) Carlisle Coatings & Waterproofing Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) W. R. Meadows, Inc.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 - C. Application: Unless otherwise indicated, use the following:
 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge.
 4. Where flashing is fully concealed, use metal flashing or flexible flashing.
 - D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
 - E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
 - F. Termination Bars for Flexible Flashing: Stainless-steel sheet 0.019 inch by 1-1/2 inches (0.48 mm by 38 mm) with a 3/8 inch (10-mm) sealant flange at top.
- 2.10 MISCELLANEOUS MASONRY ACCESSORIES
- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
 - B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 - C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
 - D. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.; Mortar Break Weep Mesh.
 - b. CavClear/Archovations, Inc.; CavClear Weep Vents.
 - c. Keene Building Products; Driwall Weep Vents 025.
 - d. Mortar Net Solutions; Mortar Net Weep Vents.

E. Cavity Drainage Material:

1. Material: Nonabsorbent polymer mesh mortar net
2. Thickness: To match cavity space.
3. Height: 16”
4. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. CavClear “CavClear Mansory Mat”
 - b. Mortar Net USA, Ltd. “Mortar Net”

2.11 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 1. For masonry below grade or in contact with earth, use Type M.
 2. For reinforced masonry, use Type S.
 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type S.
 4. For interior nonload-bearing partitions, Type O may be used instead of Type N.

- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required..
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of mortar cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Clay face brick.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

- 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
- 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
- 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
- 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
- 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

- 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
- 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).

3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: See drawings for bond pattern. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
 1. B-1 running bond.
 2. B-2 Flemish bond. See Drawings for projecting units
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
 3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 4.5 sq. ft. (0.42 sq. m) of wall area spaced not to exceed 16 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches (100 mm) in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 - 2. Build in compressible joint fillers where indicated.
- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (10 mm).
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - 2. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under water-resistive barrier, lapping at least 4 inches (100 mm). Fasten upper edge of flexible flashing to sheathing through termination bar.
 - 3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 - 4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep/cavity vent products to form weep holes.
 - 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 - 3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 - 4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

- E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 5'-4".

3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage special inspectors as selected by Owner to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Masonry Special Inspection to conform to TMS 602-16 Specifications, "Table 4-Minimum Special Inspection Requirements".
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.

- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 04 41 00 - DRY-PLACED STONE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Outcropping

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for concrete foundations.
2. Division 33 Section, "Subdrainage" for drainage system preventing accumulation of groundwater in retained soils.

1.2 REFERENCES

- A. ASTM A 123-02: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM C 97-02: Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
- C. ASTM C 119-04: Terminology Relating to Dimension Stone
- D. ASTM C 170-90 (1999): Test Method for Compressive Strength of Dimension Stone
- E. ASTM C 615-03: Specification for Granite Dimension Stone
- F. ASTM F 593-02: Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- G. ASTM F 594-02: Specification for Stainless Steel Nuts
- H. National Building Granite Quarries Association (NBGQA) Specifications for Architectural Granite.

1.3 DEFINITIONS

- A. Definitions contained in ASTM C 119 apply to this Section.**

- B. Metric Conversions:** The following metric conversions shall apply where English measurements are indicated in the text:

1. 1/16 inch (1.5 mm)
2. 1/8 inch (3 mm)
3. 3/16 inch (5 mm)
4. 1/4 inch (6 mm)
5. 5/16 inch (8 mm)
6. 3/8 inch (10 mm)

7. 1/2 inch (12 mm)
8. 5/8 inch (15 mm)
9. 13/16 inch (20 mm)
10. 1 inch (25 mm)
11. 1-3/16 inches (30 mm)
12. 1-1/4 inches (32 mm)
13. 1-1/2 inches (40 mm)
14. 1-5/8 inches (40 mm)
15. 2 inches (50 mm)
16. 3 inches (75 mm)
17. 4 inches (100 mm)
18. 6 inches (150 mm)
19. 8 inches (200 mm)
20. 12 inches (300 mm)

1.4 SUBMITTALS

- A. Product Data: For each stone type and each manufactured product shown on Drawings or specified.
 1. For each stone variety used on Project, include physical property data.
- B. Samples: Submit samples for each stone type required, exhibiting the full range of color characteristics expected.
 1. Submit a minimum of 2 each, 12 inches x 12 inches in size, in each color and finish specified.
 2. In the case of more variegated stones, color photos shall be submitted in addition to the number of samples to show the full range of color and markings to be expected.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Stone: Obtain each stone variety from a single quarry.
- B. Visual Mockup: Provide a full sized mock-up of the approved stone or stones in the approved finishes, erected at a site agreed to by the Architect, Contractor, and the Fabricator. The approved mock-up shall become the standard for the project.
 1. Build mockup of **typical exterior stone**.
 2. Size: 5 linear feet at height indicated on drawings.
 3. Color consistency: demonstrate color consistency with mockup; color range shall not exceed range of color established by samples.
 4. Included typical components.
 5. Include sealant joints installed as required by Division 07 Section "Joint Sealants."
 6. Mockup may become part of the completed Work if approved at time of Substantial Completion.
 7. Demolish mockup and remove from site after completion of stone cladding work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle materials to prevent deterioration or damage.

1. Stone shall be carefully packed and loaded for shipment using reasonable care and customary precautions against damage in transit. Material, which may cause staining or discoloration shall not be used for blocking or packing.
2. The stone shall be stacked on timber or platforms at least 4 inches above the ground. Care shall be taken to prevent staining or discoloration during storage.
3. If storage is to be for a prolonged period, polyethylene or other suitable plastic film shall be placed between wood and finished surfaces of completely dry stone.

1.7 PROJECT CONDITIONS

- A. Stain Prevention: Remove soil to prevent staining face of stone.

PART 2 - PRODUCTS

2.1 STONE SOURCE

- A. Varieties and Source: Subject to compliance with requirements, provide stone from the following source:
 1. Limestone Source: Lurvey or approved equal.
- B. Each color of limestone shall come from a single quarry, with sufficient reserves to satisfy the requirements of the project. The limestone supplier shall have the capabilities to cut and finish the stone without delaying the project.

2.2 STONE MATERIAL

- A. Limestone Building Stone Standard: ASTM C 568, classification as follows:
 1. Classification: II (Medium-Density)
 2. Density: 135 - 160 lb/cu. ft.
 3. Absorption by weight: 5 percent maximum
 4. Modulus of rupture: 800 psi minimum
- B. Special Shapes: Provide units of shape and dimensions that will produce walls of dimensions and profiles shown on Drawings and as follows:
 1. Batter: Provide units that offset from course below to provide batter of at least:
 - a. [1:24]
 - b. [1:16]
 - c. [1:14]
 - d. [1:8]
 - e. [1:5].
- C. Cap Units: Provide cap units of shape shown with smooth surfaces.
- D. Special Units: Provide corner units, end units, and other shapes as needed to produce walls of dimensions and profiles shown.

2.3 MISCELLANEOUS MATERIALS

- A. Anchors and Pins: Stainless-Steel: ASTM A 580/A 580M, Type: 304
- B. Fabric: Comply with requirements in Division 33 Section "Subdrainage."

2.4 INSTALLATION MATERIALS

- A. Pins: Stainless steel pins as recommended by stone supplier for use with stone.
- B. Leveling Base: Comply with requirements in Division 31 Section "Earthwork" for base material.
- C. Drainage Fill: Comply with requirements in Division 33 Section "Subdrainage."
- D. Soil Fill: Comply with requirements in Division 31 Section "Earthwork" for satisfactory soils.
- E. Drainage Pipe: Comply with requirements in Division 33 Section "Subdrainage."

2.5 STONE FABRICATION

- A. Fabricate stone in accordance with requirements, including Drawings and Shop Drawings.
- B. Cut and/or select stone to produce pieces of stone shown on Drawings and recommended by stone source, for faces, edges, beds, and backs.
- C. Thickness of Stone: Provide thickness shown.
- D. Dress joints (bed and vertical) straight and at right angle to face.
- E. Shape stone for type of masonry (pattern) as follows:
 - 1. Sawed-bed ashlar with uniform course heights and uniform lengths as shown on Drawings.
- F. Finish exposed faces and edges of stone to comply with requirements shown for finish and to match approved samples and mockups.
- G. Carefully inspect stone at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and conditions with Installer present.
- B. Surfaces and Conditions: Prior to installing stone, examine the existing surfaces and conditions to receive the cut stone and verify surfaces and conditions are in accordance with the

requirements and as shown on Drawings. Do not proceed until defective surfaces are brought into compliance.

3.2 PREPARATION

- A. Prior to setting cut stone, clean all surfaces to remove accumulated dirt and stains. Clean thoroughly by scrubbing with non-metallic brushes followed by a drenching with clean water. Use only mild detergents that do not contain caustic fillers.

3.3 DRY-PLACED STONE

- A. Field trim stone as stone is set.
- B. Sort stone before it is placed in wall. Remove stone that does not comply with requirements or that is unsuitable for intended use.
- C. Ashlar Pattern: Arrange stones for accurate fit in ashlar pattern with course heights as shown, random lengths, with offset between vertical joints as shown.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Set stone to comply with requirements shown on Drawings. Set stone accurately in locations shown with edges and faces aligned according to established relationships.

3.4 ADJUSTING

- A. Remove and replace stone not matching final samples and mockups.
- B. Remove and replace stone not complying with requirements.
- C. Replace non-complying stone to match final samples and mockups, comply with specified requirements. Replacement stone shall show no evidence of replacement.
- D. Patching: Minor patching in small areas may be acceptable if the repair does not distract from the overall appearance of the finished project.

3.5 PROTECTION

- A. At the end of each day's work, cover top of walls with a nonstaining waterproof covering. Protect partially finished work when not being worked on.

3.6 CLEANING

- A. Clean stone as work progresses. Remove mortar, sealant, and stains before tooling joints.
- B. Final Cleaning: Clean stone as recommended by fabricator or stone producer.
 - 1. Clean all finished stonework with a mild detergent using a fiber brush.
 - 2. After cleaning, rinse with clean water.

3. Do not use acid or other caustic materials.
- C. When cleaning is completed, remove temporary protection.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.
- 2. Grout.

- B. Related Requirements:

- 1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
- 2. Section 055000 "Metal Fabrications" for other steel items not defined as structural steel.
- 3. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for surface-preparation and priming requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
- D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified structural engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU (formerly STD).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified Structural engineer licensed in the state of Illinois, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use Load and Resistance Factor Design; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. m.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the 25 percent.
- C. W-Shapes: ASTM A 992 Grade 50
- D. Channels and Angles: ASTM A 36.
- E. Plate and Bar: ASTM A 36.
- F. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
- G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM F3125 A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Where A325 galvanized bolts and washers are required, they shall be in accordance with ASTM F2329 and ASTM 153, Class C.

- C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.
- D. Threaded Rods: ASTM F1554.
 - 1. Nuts: ASTM A 563 hex carbon steel.
 - 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 3. Finish: Hot-dip zinc coating, ASTM A 153, Class C

2.4 PRIMER

- A. Primer: Comply with Division 9 sections.
- B. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.
- C. Galvanizing Repair Paint: SSPC-Paint 20, ASTM A 780.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SPC-SP 3, "Power Tool Cleaning."
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened or as indicated on Structural Drawings.
- B. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels, shelf angles and other steel elements located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests according to requirements in AWS D1.1 on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection.

- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened unless otherwise indicated on Structural Drawings.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: The Contractor will engage a qualified special inspector approved by Owner to perform special inspections.
- B. Testing Agency: The Contractor will engage a qualified testing agency approved by Owner to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Priming: Cleaning and touchup priming are specified in Division 9 painting sections.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series and KCS-series steel joists.
 - 2. Joist accessories.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing".

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.

- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by a licensed SE in the State of Illinois.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications[.]"
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.
- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Camber joists according to SJI's "Specifications" or as indicated on plan.
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 PRIMERS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- C. Primer: Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates from ASTM A 36 steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint
- C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- D. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
- F. Welding Electrodes: Comply with AWS standards.
- G. Galvanizing Repair Paint: ASTM A 780.
- H. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

- C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1 and the following procedures, as applicable:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

City of Evanston
Evanston Animal Shelter
Holabird & Root, LLC Project No. 16015

Issued for Bid/Permit
12/08/2022

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. General Contractor.
 - a. Roof deck.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 01 - General Requirements.
 - 2. Section 05 12 00 – “Structural Steel Framing”.
 - 3. Division 05 – “Metal Fabrication” for framing deck openings with miscellaneous steel shapes.
- C. Completely coordinate with work of other trades.
- D. Sustainable Design Requirements:
 - 1. See Section 01 81 13

1.2 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. Mechanical Fastening: Installer shall demonstrate workmanship by conducting representative fastenings subject to guidance from mechanical fastener manufacturer.
- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- E. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- F. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

1.3 SUBMITTALS

- A. See Section 01 30 00 for requirements for the mechanics and administration of the submittal process.
- B. Product Data: For each type of deck, accessory, and product indicated.

- C. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction prepared under supervision of a Structural Engineer licensed in the state of Illinois.
- D. Product Certificates: For each type of steel deck, signed by product manufacturer.
- E. Welding certificates.
- F. Field quality-control test and inspection reports.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners fastener performance data including ultimate tension and shear loads and flexibility factors.
- H. Research/Evaluation Reports: For steel deck.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- C. Welding Electrodes and Mechanical Fasteners
 - 1. Store welding electrodes, mechanical fasteners and powder-actuated cartridges in original packages in a cool, dry location until final installation
 - 2. Comply with all project and national safety regulations regarding handling of welding equipment and powder-actuated fastening systems.
- D. Side Lap Connectors
 - 1. Store side-lap connectors in original packages in a cool, dry location until final installation

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 the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Deck:
 - a. ASC Profiles, Inc.
 - b. Canam Steel Corporation.
 - c. Epic Metals Corporation.
 - d. Marlyn Steel Decks, Inc.
 - e. New Millennium Building Systems, LLC.
 - f. Nucor Corp.; Verco Group.

2.2 METAL ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G60 zinc coating, typical. G90 zinc coating on exterior decks.
2. Deck Profile: As indicated on Structural Drawings.
3. Profile Depth: As indicated on Structural Drawings.
4. Design Uncoated-Steel Thickness: As indicated on Structural Drawings.
5. Span Condition: Double span.
6. Side Laps: Overlapped.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
 1. Acceptable types of side-lap connectors:
 - a. Top or side seam welds.
 - b. 1-1/2 inch long fillet welds in accordance with AWS D1.3 procedures.
 2. Mechanical side-lap connectors.
 - a. Drive mechanical side-lap connectors completely through adjacent lapped roof deck sheets to achieve positive engagement of adjacent sheets with a minimum of three thread penetration.
 - b. Material: ASTM A 510 Grade 1022
 - c. Hardness: Minimum Vickers Surface Hardness of 450 HV0.3
 - d. Design and Manufacture: Hex washer head undercut with reverse serrations; self-piercing or stitch point at center
 3. Design Requirements:
 - a. ICC-ES AC43 or SDI method for diaphragm shear strength and stiffness
- C. Welds:
 1. Material: Electric shielded arc process using minimum E60XX electrodes in accordance with AWS D1.3 procedures
 2. Weld Quality: All welds uniform size and appearance and free of pinholes, porosity, undercutting or other defects
 3. Weld Size: Minimum 5/8 in. effective diameter
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch, design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- H. Recessed sump pans: single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. for drains, cut holes in the field.
- I. Galvanizing repair paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

- J. Repair paint: manufacturer's standard rust-inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- C. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- D. Locate deck bundles to prevent overloading of supporting members.
- E. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- F. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- G. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- H. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- I. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members with mechanical fasteners, by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.
- B. Side-Lap: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.

- D. Roof Sump Pans: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
 - 1. Install reinforcing channels or zees or Unistrut in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor will engage a qualified independent testing and inspecting agency approved by Owner to perform field tests and special inspections and prepare test reports.
- B. Refer to structural drawings for IBC Special Inspections Requirements.
- C. Field welds will be subject to inspection.
- D. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- E. Remove and replace work that does not comply with specified requirements.
- F. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Shelf angles.
5. Metal ladders.
6. Loose bearing and leveling plates for applications where they are not specified in other Sections.
7. Prefabricated Planters.
8. Metal Cladding.

- B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

- C. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 051200 "Structural Steel Framing."
4. Section 129300 "Site Furnishings" for bicycle racks, tree grates and other pre-manufactured items.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's Product Literature and Specification Data.
 - 2. Manufacturer's written instructions for recommended maintenance practices.
 - 3. Written manufacturer's warranty.
 - 4. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 5. Paint products.
 - 6. Grout.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Shelf angles.
 - 5. Metal ladders.
 - 6. Loose steel lintels.
- D. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- E. Samples for Verification: For each type and finish.
- F. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer, installer, and fabricator.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Preconstruction test reports.
- D. Source quality-control test reports.
- E. Field quality-control and special inspection reports.
- F. Maintenance Instructions.
- G. Welding certificates.
- H. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- I. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Authorities Having Jurisdiction for all work included in this section.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- D. Codes and Standards: Conform work to all applicable codes and standards.
- E. Manufacturer Qualifications: Provide manufacturer qualifications as follows:
 - 1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
 - 2. Submit qualifications of manufacturer.
 - 3. Submit manufacturer's quality control program.
 - 4. Submit example of Material Warranty and any other applicable warranties.
- F. Installer Qualifications: Provide installer qualifications as follows:

1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
2. Submit resumes and/or qualifications of installation manager(s).
3. Submit fabrication quality control program.
4. Submit installation quality control program.
5. Submit example of Material Warranty and any other applicable warranties.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged products in an undamaged condition in original containers, displaying manufacturer's labels, along with instructions for handling, storing, unpacking, protecting, and installing.
- B. Deliver and store materials in manufacturer's original containers, with seals unbroken and identification labels intact until time of use.
- C. Deliver products to achieve the shortest duration of storage time as practicable.
- D. Deliver all chemical products in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in weather protected enclosure.
- E. Comply with manufacturer's written instructions for delivery, storage, and handling, and as required to prevent damage to products and work during construction.
- F. Store products and materials in a neat and orderly manner. Maintain clear aisles and access to work areas. Protect stored products from theft and damage. Store products above ground in weathertight, ventilated packaging or enclosures.
- G. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- H. Store liquids in tightly closed containers protected from freezing.
- I. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- J. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
- B. The work shall not occur in the presence of standing water, mud, snow, or frozen subgrade conditions. Work shall not occur while precipitation is occurring or during excessive winds, or when temperatures are outside the limits specified in this specification. Work completed during these conditions will be rejected.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements.

1.9 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the utility locate services is required for all Excavation and grading deeper than 12 inches: The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the local utility locator service.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering and wear.
 - b. Separation or delamination of materials and components.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316L.
- E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.
- F. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- G. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- J. Weathering Steel Plate and Sheet: A242.
- K. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: As indicated.
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, with G90 (Z275) coating.
- L. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- M. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- N. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- O. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- P. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
 3. Provide stainless-steel fasteners for fastening nickel silver.
 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 RESIN PANELS

- A. Koda XT as Manufactured by 3form. www.3-form.com.

2.5 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

2.8 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3.
- B. Steel Ladders:
 - 1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
 - 2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
 - 3. Rungs: 1-inch- (25-mm-) square steel bars.
 - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
 - 6. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
 - 7. Galvanize and prime ladders, including brackets.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.

2.11 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STAINLESS STEEL FINISHES

- A. No. 6, standard non-directional brushed finish.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless zinc-rich primer or primers specified in Section 099600 "High-Performance Coatings" are indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.15 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to installation examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
- B. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.
- C. Confirm that no adverse drainage conditions are present.
- D. Confirm that no conditions are present which are detrimental to plant growth.
- E. Confirm that utility work has been completed per the drawings.
- F. If unsatisfactory conditions are encountered, notify the Architect and Owner immediately to determine corrective action prior to proceeding.

3.2 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting." or Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 GRADE AND ELEVATION CONTROL

- A. Provide grade and elevation control during installation of the work of this section. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.6 REPAIR AND REPLACEMENT

- A. General: Repair or replace that is damaged by construction operations, in a manner approved by Architect.

3.7 WASTE HANDLING

- A. General: Handle waste according to Section 017419 "Construction Waste Management and Disposal."

3.8 PROTECTION

- A. Contractor shall furnish and install construction fence around exterior installations to prevent access. Fencing shall be maintained in place for a minimum of 48 hours after completion of installation, or as directed by the Landscape Architect. Drying period may take longer due to weather conditions.
- B. Contractor shall notify Landscape Architect that landscape irrigation shall be restricted near installations until applicable drying period is complete. Standing water on installations shall be restricted at all times.

END OF SECTION 055000

SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Wood blocking, cants, and nailers.
 2. Plywood backing panels.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Sustainable Design Submittals:
1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 3. Product Data: For installation adhesives, indicating VOC content.
 4. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
1. Fire-retardant-treated wood.
 2. Power-driven fasteners.
 3. Post-installed anchors.

1.5 QUALITY ASSURANCE

- A. **Testing Agency Qualifications:** For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- B. **Certified Wood:** Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. **Vendor Qualifications:** A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. **Regional Materials:** Manufacture dimension lumber, except treated materials, within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
- B. **Certified Wood:** Certify lumber and plywood as "FSC Pure" or "FSC Mixed Credit" in accordance with FSC STD-01-001 and FSC STD-40-004.
- C. **Lumber:** DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- D. **Maximum Moisture Content of Lumber:** 15 percent unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. **General:** Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Cants.
 - 4. Furring
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather or in area of high relative humidity, provide

fasteners of Type 304 stainless steel.

- B. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- E. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
4. Sheathing joint and penetration treatment.

- B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

- B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Product Data: For installation adhesives, indicating VOC content.
3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated plywood.
 2. Fire-retardant-treated plywood.
 3. Foam-plastic sheathing.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Certified Wood: The following wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
1. Plywood.
 2. Oriented Strand Board.

- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood unless otherwise indicated Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:

1. Roof and wall sheathing within 48 inches (1220 mm) of fire walls.

2.5 WALL SHEATHING

- A. Plywood Sheathing: , Exposure 1, Structural I sheathing.
 1. Span Rating: Not less than 24/0.
 2. Nominal Thickness: As indicated on Structural Drawings.
- B. Oriented Strand Board: Exposure 1, Structural 1 sheathing.
 1. Span Rating: Not less than 24/0.
 2. Nominal Thickness: As indicated on Structural Drawings.
- C. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Building Products; Dens-Glass Gold.
 - b. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - c. United States Gypsum Company; Securock.
 2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.

2.6 PARAPET SHEATHING

- A. Plywood Sheathing: , Exposure 1, Structural I sheathing.
 1. Span Rating: Not less than 48/24.
 2. Nominal Thickness: As indicated in drawings, but not less than 1/2 inch (13 mm).
- B. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Co.; "Dens-Glass Gold Sheathing".
 - b. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - c. United States Gypsum Company; Securock.
 2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For parapet and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.
- F. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 4. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

END OF SECTION 06 16 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes framing using structural glued-laminated timber.
- B. Related Requirements:
 - 1. Section 061053 "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.
 - 2. Section 061600 "Sheathing".

1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 3. For connectors. Include installation instructions.
- B. Shop Drawings:
 - 1. Show layout of structural glued-laminated timber system and full dimensions of each member.
 - 2. Indicate species and laminating combination.
 - 3. Include large-scale details of connections.

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.
- B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.
- C. Research/Evaluation Reports: For structural glued-laminated timber and timber connectors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC or APA-licensed firm that is certified for chain of custody by an FSC-accredited certification body.
 - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APS-EWS trademark. Place mark on surfaces that will not be exposed in the completed work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.
 - 1. Provide structural glued-laminated timber made from single species.
 - 2. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
 - 3. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
 - 4. Adhesive shall not contain urea-formaldehyde resins.
- B. Certified Wood: Glued-laminated timber shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- C. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch that complies with structural properties indicated on the drawings.

Lay-up: Unbalanced for simple ,single-span beams. Balanced for beams with cantilever span.

1. Species and Combination Symbol: Douglas fir -larch (DF).

D. Appearance Grade: Architectural , complying with AITC 110.

1. For Architectural appearance grades, fill voids as required by AITC 110.

2.2 PRESERVATIVE TREATMENT

A. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, comply with AWWA U1, Use Category 3B

1. Use preservative solution without substances that might interfere with application of indicated finishes.
2. Do not incise structural glued-laminated timber or wood used to produce structural glued-laminated timber.

B. Preservative: One of the following:

1. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
2. Pentachlorophenol in light petroleum solvent.
3. Copper naphthenate in a light petroleum solvent.

2.3 TIMBER CONNECTORS

A. Materials: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36.
2. Round steel bars complying with ASTM A 575, Grade M 1020.
3. Type 304 stainless steel is usually standard; use Type 316 where subject to salt spray or immersion in salt water. Type 316 is more expensive and cannot be distinguished from Type 304 except by chemical tests.

B. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123 or ASTM A 153.

2.4 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

- C. Sealers shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 FABRICATION

- A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 1. Dress exposed surfaces as needed to remove planing and surfacing marks.
- B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- C. End-Cut Sealing: Immediately after end cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit[except for preservative-treated wood where treatment included a water repellent.

2.6 FACTORY FINISHING

- A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.
 - 1. Color: As selected by Architect from manufacturer's full range.
- B. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.
- C. Finishing materials shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
 - 1. Predrill for fasteners using timber connectors as templates.
 - 2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 3. Coat cross cuts with end sealer.
 - 4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWWPA M4.
 - a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
 - b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.
- D. Install timber connectors as indicated.
 - 1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
 - 2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes] after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 FIELD QUALITY CONTROL

- A. Testing and Inspecting: The Contractor will engage a qualified testing and inspecting agency to perform field tests and special inspections and prepare test reports.
- B. Refer to IBC for Special Inspections Requirements.

3.5 PROTECTION

- B. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
 - 1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
 - 2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood cladding.
 - 2. Misc carpentry items not specified elsewhere.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications."

1.3 DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal (38 mm actual) in thickness and 2 inches nominal (38 mm actual) or greater in width.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Meeting: Conduct meeting at Project Site, Manufacturer's Facility of Fabricator's Shop. Confirm with Owner and Landscape Architect 14 days prior to conference.

1. Before submitting submittals, review submittals and other requirements of this section and examine procedures for ensuring quality of the scope herein. Require representatives of each entity directly concerned with the scope herein, including but not limited to, the following:
 - a. Contractor's superintendent.
 - b. Subcontractor.
 - c. Special Subcontractor.
 - d. Independent testing agency responsible for testing.
 - e. Product manufacturer and/or local representative.

2. Review methods and procedures related to , including but not limited to, the following:
 - a. Responsibilities of each party.
 - b. Lines of authority and communication for the project. Procedures for resolution of any project document ambiguity.
 - c. Methods for documenting, reporting, and distributing documents and reports.
 - d. Proposed sources of materials.
 - e. Procedures for packaging and storing archive samples.
 - f. Review of the time schedule for all installation and testing. Schedule of workdays and/or starting times if third party testing verification is required.
 - g. Quality control.
 - h. Temperature and weather limitations. Installation procedures for adverse weather conditions. Defining acceptable subgrade or ambient moisture and temperature conditions for working during installation.
 - i. Subgrade conditions, dewatering responsibilities, and subgrade maintenance plan.
 - j. Deployment techniques including allowable subgrade conditions.
 - k. Construction, material placement, and backfilling.
 - l. Requirements for protecting work, including restriction of traffic and adjacent work impacting during installation period and for remainder of construction period.
 - m. Measurement and payment schedules.
 - n. Health and safety.
 - o. Procedures and responsibilities for preparation and submission of as-built drawings.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product submit the following:
 1. Manufacturer's Product Literature and Specification Data.
 2. Manufacturer's written instructions for recommended maintenance practices.
 3. Color samples for verification and selection.
 4. Written manufacturer's warranty.
 5. Product liability insurance certificate with project owner as certificate holder.
 6. MSDS for items in Part 2 "Products."

- B. Samples for Initial Selection: Standard manufacturer's and/or fabricator's samples of each type of product, material, ingredient, admixture, finish, and/or color requiring selection.

- C. Samples for Verification: For each type of selection made above provide a final sample.

- D. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Submit shop drawings within a reasonable time so as not to delay the start of material fabrication and installation.
 - 2. Submit shop drawings per above allowing a minimum review time of 10 business days for review and response. Per above, also allow enough time for revisions and resubmittal where reasonably predictable.
 - 3. Shop drawings shall show the proposed layout identifying all components and details based on field verified conditions and measurements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. For all materials.
- D. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.
- E. Evaluation Reports: For preservative-treated wood products, from ICC-ES.
- F. Field quality-control reports.
- G. Minutes of pre-installation conference.
- H. Maintenance Instructions.
- I. Warranty: Written manufacturer's warranty.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Authority Having Jurisdiction for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- B. Codes and Standards: Conform work to all applicable codes and standards.

C. Installer Qualifications: Provide installer qualifications as follows:

1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
2. Submit resumes and/or qualifications of installation manager(s).
3. Submit fabrication quality control program.
4. Submit installation quality control program.
5. Submit example of Material Warranty and any other applicable warranties.

D. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified for testing indicated. Provide testing agency qualification as follows:

1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
2. Submit resumes and/or qualifications of testing manager(s).
3. Submit testing quality control program.
4. Submit example of Material Warranty and any other applicable warranties.

E. Mockups: Provide mockup for each type of component per the drawings and/or shop drawing.

1. Build mockups of full-profile sections to demonstrate including but not limited to overall material quality, typical joints; typical transitions, surface finish, surface texture, color; and standard of workmanship.
2. Build mockups in the location and of the size indicated. Build mockups where directed by Landscape Architect.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may not become part of the completed work.
5. Mockups to be retained on site or at approved location by Owner and Landscape Architect until all related work scope is deemed Substantially Complete.
6. Contractor to rework mockups as necessary until mockups are accepted.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged products in an undamaged condition in original containers, displaying manufacturer's labels, along with instructions for handling, storing, unpacking, protecting, and installing.

- B. Deliver and store materials in manufacturer's original containers, with seals unbroken and identification labels intact until time of use.
- C. Deliver products to achieve the shortest duration of storage time as practicable.
- D. Deliver all chemical products in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in weather protected enclosure.
- E. Comply with manufacturer's written instructions for delivery, storage, and handling, and as required to prevent damage to products and work during construction.
- F. Store products and materials in a neat and orderly manner. Maintain clear aisles and access to work areas. Protect stored products from theft and damage. Store products above ground in weathertight, ventilated packaging or enclosures.
- G. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- H. Store liquids in tightly closed containers protected from freezing.
- I. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- J. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.10 FIELD CONDITIONS

- A. The work shall not occur in the presence of standing water, mud, snow, or frozen subgrade conditions. Work shall not occur while precipitation is occurring or during excessive winds, or when temperatures are outside the limits specified in this specification. Work completed during these conditions will be rejected.
- B. Cold-Weather Protections: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- C. Hot-Weather Placement:

1.11 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the utility locate services is required for all Excavation and grading deeper than 12 inches: The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the local utility locator service.

1.12 MOCK-UP INSTALLATION

- A. Confirm location of mockup(s) with Landscape Architect prior to installation.

1.13 OBSERVATION OF THE WORK

- A. The Landscape Architect may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.
- B. The Landscape Architect shall be informed of the progress of the work so the work may be observed during key times in the construction process. The Landscape Architect shall be afforded sufficient time to schedule visit to the site. Failure of the Landscape Architect to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1.14 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering and wear.
 - b. Separation or delamination of materials and components.
 - 2. Warranty Period: 1 year from date of Substantial Completion.

1.15 MAINTENANCE SERVICE

- A. Contractor to provide standard industry maintenance on all scope items herein until Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
 - 1. Factory mark each item with grade stamp of grading agency.
 - 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
 - 1. Boards: 15 percent.
 - 2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness] [15 percent for 2-inch nominal (38-mm actual) thickness or less; no limit for more than 2-inch nominal (38-mm actual) thickness.
 - 3. Timber. 19 percent.

2.2 WOOD SPECIES, GENERAL

- A. Ipe (*Handroanthus* spp.)

2.3 LUMBER

- A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Boards (Tropical Hardwoods):
 - 1. Ipe: Clear.

2.4 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWWA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

- B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.
 - 1. Treatment with CCA shall include post-treatment fixation process.
- C. Pressure treat poles with waterborne preservative according to AWPA U1; Use Category UC4a.
 - 1. Treatment with CCA shall include post-treatment fixation process.
- D. Preservative Chemicals: Acceptable to authorities having jurisdiction.
 - 1. Do not use chemicals containing arsenic or chromium [except for timber posts] [except for poles] [except for timber posts and poles].
- E. Use process[for boards and dimension lumber] that includes water-repellent treatment.
- F. Use process[for boards and dimension lumber] that does not include water repellents or other substances that might interfere with application of indicated finishes.
- G. After treatment, redry [boards] [dimension lumber] to 19 percent maximum moisture content.
- H. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 - 1. For items indicated to receive a stained or natural finish, mark each piece on surface that will not be exposed or omit marking and provide certificates of treatment compliance issued by inspection agency.
- I. Application: Treat [all wood unless otherwise indicated] [items indicated on Drawings].

2.5 CONNECTORS

- A. General: Provide connectors of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture.
 - 1. Use stainless steel, Type 316 unless otherwise indicated.
 - 2. For pressure-preservative-treated wood, use stainless-steel connectors.
- B. Connectors to be Simpson Strong-Tie or approved equal.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. Use stainless steel, type 316 unless otherwise indicated.
 2. For pressure-preservative-treated wood, use stainless-steel fasteners.
- B. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2 (ASTM F 738M, Grade A1 or Grade A4); with ASTM F 594, Alloy Group 1 or 2 (ASTM F 836M, Grade A1 or Grade A4) hex nuts and, where indicated, flat washers.
- C. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E 488, conducted by a qualified independent testing and inspecting agency.
1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or Grade A4).
- D. Nails: ASTM F 1667.
- E. Power-Driven Fasteners: ICC-ES AC70.
- F. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- G. Hidden Fastening Systems For Boards:
1. For Standard Profiles:
 - a. Tiger Claw TC-4S For Tropical and Domestic Hardwoods.
 - b. Tiger Claw TC-2S For Domestic Softwoods.
 2. For Pre-Grooved Profiles:
 - a. Ipe Clip, For Tropical and Domestic Hardwoods:
 - 1) Joint size:
 - a) 3/32" – Ipe Clip Extreme
 - b) 5/32" – Ipe Clip Extreme4
 - c) 1/4" – Ipe Clip ExtremeKD
 - b. Mantis, 3/16" joint size, For Tropical and Domestic Hardwoods and Domestic Softwoods (coordinate with manufacturer on proper board groove height):
 - 1) Mantis Hardwood Clip w/ Powder Coated Stainless Steel Fasteners
 - 2) Starter Clip w/ Powder Coated Stainless Steel Fasteners
 - 3) Transition Clip w/ Powder Coated Stainless Steel Fasteners
 - 4) Finish Clip w/ Powder Coated Stainless Steel Fasteners

2.7 METAL ACCESSORIES

- A. Stainless-Steel Sheet: ASTM A 666, Type 316.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to installation examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
- B. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.
- C. Confirm that no adverse drainage conditions are present.
- D. Confirm that no conditions are present which are detrimental to plant growth.
- E. Confirm that utility work has been completed per the drawings.
- F. If unsatisfactory conditions are encountered, notify the Landscape Architect immediately to determine corrective action prior to proceeding.

3.2 PREPARATION

- A. Prime wood[indicated to be painted], including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."
- B. Stain wood[indicated to be stained], including both faces and edges. Cut to required lengths and stain ends. Comply with requirements in Section 099300 "Staining and Transparent Finishing."

3.3 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- G. Apply copper naphthenate field treatment to comply with AWWPA M4, to cut surfaces of preservative-treated lumber.
- H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.
 - 3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.
- I. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

3.4 GRADE AND ELEVATION CONTROL

- A. Provide grade and elevation control during installation of the work of this section. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.5 REPAIR AND REPLACEMENT

- A. General: Repair or replace that is damaged by construction operations, in a manner approved by Landscape Architect.

3.6 WASTE HANDLING

- A. General: Handle waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

3.7 CLEANING

- A. The contractor should clean the job site and remove any excess materials.

3.8 PROTECTION

- A. Contractor shall furnish and install construction fence around new installations to prevent access. Fencing shall be maintained in place for a minimum of 48 hours after completion of installation, or as directed by the Landscape Architect. Drying period may take longer due to weather conditions.
- B. Contractor shall notify Landscape Architect that landscape irrigation shall be restricted near installations until applicable drying period is complete. Standing water on installations shall be restricted at all times.

3.9 MAINTENANCE SERVICE

- A. Maintenance Service: Provide maintenance by skilled employees of Installer. Maintain as required in "Maintenance" Article. Begin maintenance immediately after scope is installed and continue until final acceptance.

3.10 DEMONSTRATION

- A. Engage a manufacturer-authorized service representative and/or other authorized professional to train Owner's maintenance personnel to adjust and operate all components herein.
- B. Train Owner's maintenance personnel in proper maintenance procedures for all components herein.

END OF SECTION 06 10 63

SECTION 06 4116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes plastic-laminate clad architectural cabinets in the following rooms:
 - 1. Office, Room 07
 - 2. Education & Training, Room 01
 - 3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

- B. Related Requirements:
 - 1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
 - 2. Section 12 3661 "Solid Surface Countertops" for countertops to be placed on plastic laminate cabinets

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Sustainable Design Submittals:
 - 2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 3. For adhesives, indicating compliance with requirements for low-emitting materials.
 - 4. Laboratory Test Reports: For composite wood products, indicating compliance with

- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show large-scale details.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

C. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.
 - a. Provide one sample applied to core material with specified edge material applied to one edge.
2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Engage a qualified fabricator, acceptable to the Architect, that is an AWI-member firm; that has not less than 10 years' experience in the custom fabrication and installation of architectural woodwork comparable to that indicated, on not less than 5 projects, acceptable to the Architect, that are comparable in material, design, and extent to that indicated; that has production facility with capacity to produce required units without causing delay in the Work; and whose work has resulted in construction with a record of successful in-service performance.
- B. Installer Qualifications: Manufacturer of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support cabinets by field

measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
- B. Architectural Woodwork Standards Grade: Custom.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade VGS.
 - 3. Edges: Match Architect's samples. Grade HGS.
 - 4. Pattern Direction: As indicated.
- G. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.
 - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

- B. Composite Wood and Agrifiber Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Thermoset decorative panels are frequently called "melamine." If retaining "Thermoset Decorative Panels" Subparagraph below, also retain "Medium-Density Fiberboard (MDF)" Subparagraph and applicable "Particleboard" Subparagraph.
5. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening.

- B. Back-Mounted Pulls: BHMA A156.9, B02011.

- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

- E. Shelf Rests: BHMA A156.9, B04013; metal.

- F. Drawer Slides: BHMA A156.9.

1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel, ball-bearing slides.
2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
3. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
5. For computer keyboard shelves, provide Grade 1HD-100.
6. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

- G. Door Locks: BHMA A156.11, E07121.

- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Finish: Match Architect's sample.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Install glass to comply with applicable requirements in Section 08 8000 "Glazing" and in GANA's "Glazing Manual."
 - 1. For glass in frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. If hanging cleats are not indicated, fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Plastic sheet paneling.

- B. Related Requirements:

- 1. Section 102600 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Sustainable Design Submittals:

- 1. Product Data: For adhesives, indicating VOC content.

- 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

- 3. Product Data: For sealants, indicating VOC content.

- 4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

- 5. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.

- C. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient

temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Crane Composites, Inc.
 - b. Marlite, Inc.
 - 2. Verify wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 4. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
 - 5. Surface Finish: As selected by Architect from manufacturer's full range.
 - 6. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 - 1. Color: As selected by Architect from manufacturer's full range.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Adhesive: As recommended by plastic paneling manufacturer.

1. Verify adhesives have a VOC content of 50 g/L or less.
 2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."
1. Verify sealant has a VOC content of 250 g/L or less.
 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches (300 mm) wide.

3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.

- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- F. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
- G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Polyisocyanurate foam-plastic board.
3. Glass-fiber blanket.
4. Mineral-wool blanket.

- B. Related Requirements:

1. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
2. Section 07 21 19 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
3. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.
4. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For insulation, indicating compliance with requirements for low-emitting materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Extruded Polystyrene Board, Type IV ASTM C 578, Type IV, 25-psi (173-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company (The); STYROFOAM Brand
 - b. DuPont de Nemour, Inc:
 - c. Owens Corning; Foamular.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Extruded Polystyrene Board, Type VI: ASTM C 578, Type VI, 40-psi (276-kPa) minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C 1289, glass-fiber-mat faced, Type II, Class 2.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Polyiso Roof and Wall Insulation.
 - b. Carlisle Coatings & Waterproofing Inc.
 - c. Firestone Building Products.
 - d. Johns Manville; a Berkshire Hathaway company.
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.3 GLASS-FIBER BLANKET

- A. Verify insulation complies with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50% percent.
- C. Glass-Fiber Blanket, Unfaced IB-1 ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Certainteed; SAINT-GOBAIN.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.

2.4 MINERAL-WOOL BLANKETS

- A. Verify insulation complies with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 35% percent.
- C. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Owens Corning.

c. ROCKWOOL.

2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products that are compatible with insulation system.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

2.6 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
1. Adhesives shall have a VOC content of 70 g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm) in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Closed-cell spray polyurethane foam.
- B. Related Requirements:
 - 1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2.0 lb/cu. ft. Insert density and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

SECTION 07 26 16 – BELOW SLAB VAPOR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Below slab vapor barriers.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete".
2. Section 07 21 00 "Thermal Insulation" for thermal insulation.

1.2 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- ##### A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 PLASTIC VAPOR BARRIERS

A. Plastic Vapor Barriers: Provide one of the following.

1. Extruded Plastic Vapor Barrier: Polyolefin membrane.

a. Properties

- 1) Thickness: 15 mil
- 2) Water vapor permeance: Less than 0.01 perms, as tested in accordance with mandatory conditioning tests as per ASTM E 1745 Section 7.1.
- 3) Strength: ASTM E1745 Class A

b. Manufacturers:

- 1) Stego Industries ::C "Stego Wrap 15 mil Vapor Barrier"
- 2) Reef Industries "Vaporguard"
- 3) Sundance, Inc. "Sundance 15 mil Vapor Barrier"

2. Miscellaneous:

- a. Adhesive: Manufacturer's recommended pointing mastic.
- b. Joint tape: Manufacturer's recommended joint tape.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions: Examine and correct conditions of area to receive the Work prior to installation.

3.2 INSTALLATION

- A. General: Install system in accordance with manufacturer's printed installation instructions, submittals, and applicable industry standards.
- B. Plastic Vapor Barrier:
 - 1. General: Provide vapor barrier as a continuous membrane through slab-on-grade areas throughout the project area.
 - 2. Install in compliance with ASTM E 1643.
 - 3. Place vapor barrier with the longest dimension parallel with the direction of the pour.
 - 4. Lap Vapor barrier over footings and seal to foundation walls. Seal all penetrations.
 - 5. Lap joints 6 inch and seal and recommended pressure sensitive tape.
 - 6. Seal pipe penetrations with pipe boot made from vapor barrier and tape.
 - 7. Protect vapor barrier from damage during installation of reinforcing steel and utilities.
 - 8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with pressure sensitive tape.
 - 9. Continuously tape perimeter of under slab vapor barrier to foundation wall.

3.3 PROTECTION

- A. Protect vapor barriers from damage until concealed by permanent construction.

END OF SECTION 07 26 00

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Vapor-retarding, fluid-applied air barriers.

- B. Related Requirements:

- 1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Sustainable Design Submittals:

1. Product Data: For coatings, indicating VOC content.
2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. VOC Content: 115 g/L or less.
- C. Low-Emitting Materials: Verify products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. VOC Emissions: Products shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa) when tested according to ASTM E 2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

- A. High-Build, Vapor-Retarding Air Barrier: Modified bituminous or synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.

1. Modified Bituminous Type:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing Inc; Barriseal S.
 - 2) Tremco Incorporated; ExoAir 120.
 - 3) W. R. Meadows, Inc; Air-Shield LM.
2. Synthetic Polymer Type:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing Inc; Barritech VP.
 - 2) Sto; VaporSeal.
 - 3) W. R. Meadows, Inc; Air-Shield LSR.
3. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Maximum 0.1 perm (5.8 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method.
 - c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
 - d. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested according to ASTM D 4541.
 - e. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch (0.5 mm) thick, and Series 300 stainless-steel fasteners.
- D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Dow Corning Corporation; Dow Corning® 123 Silicone Seal.
- b. GE Construction Sealants; Momentive Performance Materials Inc.; US11000 UltraSpan.
- c. Pecora Corporation; Sil-Span.
- d. Tremco Incorporated; Spectrem Simple Seal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

- H. Bridge isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
 - 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone extrusion so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
 - 1. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils (0.9 mm).
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency selected by Owner to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Air-barrier dry film thickness.
 - 3. Continuous structural support of air-barrier system has been provided.
 - 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 5. Site conditions for application temperature and dryness of substrates have been maintained.
 - 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 7. Surfaces have been primed, if applicable.

8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

C. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers ASTM E 1186, chamber depressurization using detection liquids.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 07 4213 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-fastener, lap-seam metal wall panels at clerestory and screen walls.

B. Related Requirements:

1. Roof Screen in section 10 8213 "Roof Screen."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

D. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Samples of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on 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 specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient.

2.2 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
- B. Clerestory; Rib-Profile, Exposed-Fastener Metal Wall Panels:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Morin BR-28, or comparable product by one of the following:

- a. CENTRIA Architectural Systems.
 - b. Fabral Metal Wall and Roof Systems.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.028 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
- C. Screenwall: Rib-Profile, Exposed-Fastener Metal Wall Panels:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Morin U-24 Profile B, or comparable product by one of the following:
 - a. CENTRIA Architectural Systems.
 - b. Fabral Metal Wall and Roof Systems.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.036 inch (0.71 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae,

parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

- A. Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

- A. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- B. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 07 4213

SECTION 07 5423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Substrate board.
3. Vapor retarder.
4. Roof insulation.
5. Cover board.
6. Vector mapping grid.
7. Walkways.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07 6200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

- ##### A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.

7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
4. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
5. Environmental Product Declaration: For each product.
6. Health Product Declaration: For each product.
7. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
6. Tie-in with adjoining air barrier.

D. Samples for Verification: For the following products:

1. Roof membrane and flashings, of color required.
2. Walkway pads or rolls, of color required.

E. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

- a. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- D. Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Field Test Reports:
 1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
 2. Leak-detection; submit EFVM (Electric Field Vector Mapping) test results.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed or listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation

manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

- 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, and other components of roofing system.
- 2. Warranty Period: 20 years from date of Substantial Completion.
- 3. Leak Detection System: Contractor shall warrant system for a period of 5 years after final inspection

- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form acceptable to Owner, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:

- 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

- 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
- 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures

when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. Wind Loads: The roofing assemblies shall be designed, fabricated, and installed to withstand the maximum inward and outward wind pressures as determined according to ASCE/SEI 7-10.
- D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
 1. Fire/Windstorm Classification: Class 1A-90.
 2. Hail-Resistance Rating: SH.
- E. Solar Reflectance Index (SRI): Three-year-aged SRI not less than 64 or initial SRI not less than 82 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D 6878/D 6878M, internally fabric- or scrim-reinforced, TPO sheet.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle SynTec Incorporated.
 - b. Firestone Building Products.
 - c. Flex Membrane International Corp.
 - d. Johns Manville; a Berkshire Hathaway company.
 2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
 3. Thickness: 60 mils, nominal, or as indicated.
 4. Exposed Face Color: Light grey to meet SRI requirements.
 5. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 5% percent.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 1. Verify adhesives and sealants comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.

- d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. PVC Welding Compounds: 510 g/L.
 - g. Other Adhesives: 250 g/L.
 - h. Single-Ply Roof Membrane Sealants: 450 g/L.
 - i. Nonmembrane Roof Sealants: 300 g/L.
 - j. Sealant Primers for Nonporous Substrates: 250 g/L.
 - k. Sealant Primers for Porous Substrates: 775 g/L.
2. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
 - C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
 - D. Bonding Adhesive: Manufacturer's standard.
 - E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
 - F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
 - G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
 - H. Vector Mapping Grid: Roofing system manufacturer's standard stainless steel (Type 304) grid to serve as conductive medium.
 - 1. Accessories: Provide EFVM Connection Kit and other accessories recommended by roofing system manufacturer for field quality control testing of installed roof membrane.
 - I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.
- 2.4 SUBSTRATE BOARDS
- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
 - 1. Thickness: Type X, 1/2 inch thick.
 - B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D 1970/D 1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Carlise; VapAir Seal MD or comparable product as approved by Architect.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer, approved for use in FM Approvals' RoofNav-listed roof assemblies.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. Size: 48 by 48 inches.
 - 2. Thickness: As indicated on Drawings or if not indicated, 6 inches minimum.
 - a. Base Layer: 2 inches, minimum
 - b. Upper Layer: As indicated, or as required to provide indicated minimum total R Value.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/4 inch.
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer, one of the following:
 - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
 - 2. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
 - 3. Verify adhesives and sealants comply with the following limits for VOC content:

- a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. PVC Welding Compounds: 510 g/L.
 - g. Other Adhesives: 250 g/L.
 - h. Single-Ply Roof Membrane Sealants: 450 g/L.
 - i. Nonmembrane Roof Sealants: 300 g/L.
 - j. Sealant Primers for Nonporous Substrates: 250 g/L.
 - k. Sealant Primers for Porous Substrates: 775 g/L.
4. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Cover Board: Provide one of the following:
1. Glass-Mat: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Georgia-Pacific Building Products.
 - 2) National Gypsum Company.
 2. Gypsum-Fiber Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water resistant gypsum substrate, 1/2 inch thick.
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) United States Gypsum Company.

2.8 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
1. Size: Approximately 24 by 24 inches.
 2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that the roof deck is clean, dry, supported, and suitable for installation of the roofing system.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 - 1. Submit test result within 24 hours after performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

3.5 VAPOR-RETARDER INSTALLATION

- A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively. Seal laps by rolling.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - c. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - d. Fill gaps exceeding 1/4 inch with insulation.
 - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - f. Mechanically attach base layer of insulation through substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
 2. Install upper layers of insulation and tapered insulation with joints of each layer offset not

less than 12 inches from previous layer of insulation.

- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
- b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
- d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
- e. Fill gaps exceeding 1/4 inch with insulation.
- f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- g. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
 - 1) Set each layer of insulation in ribbons of bead-applied or uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
 - a. Set cover board in ribbons of bead-applied or uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 INSTALLATION OF VECTOR MAPPING GRID

- A. Install vector mapping grid over cover board, overlapping at edges and ends according to roof manufacturer's and EFVM system manufacturer's written instructions, and the roof manufacturer's full system's warranty.

3.9 ADHERED ROOFING INSTALLATION

THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install roof membrane.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.10 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.11 WALKWAY INSTALLATION

A. Flexible Walkways:

1. Install flexible walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. As required by roof membrane manufacturer's warranty requirements.
2. Provide 6-inch clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
4. Coordinate location of walkway pads so that they are not installed directly on roof membrane seams.

3.12 FIELD QUALITY CONTROL

- #### A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
1. Electronic Leak-Detection Testing:
 - a. Testing agency shall test each deck area for leaks using an electronic leak-detection method that locates discontinuities in the roofing membrane.
 - b. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
 - c. Testing agency shall create a conductive electronic field over the area of roofing to be tested and electronically determine locations of discontinuities or leaks, if any, in the roofing.
 - d. Testing agency shall provide survey report indicating locations of discontinuities if any.
 - B. Manufacturer's Field Service: Engage roofing-membrane manufacturer's authorized service representative to provide periodic inspection of roof assembly installation and prepare inspection reports.
 - C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
 - E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Manufactured through-wall flashing with counterflashing.
2. Manufactured reglets with counterflashing.
3. Formed low-slope roof sheet metal fabrications.
4. Formed equipment support flashing.
5. Formed overhead-piping safety pans.

- B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

- C. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of roof-penetration flashing.
 - 8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 9. Include details of special conditions.
 - 10. Include details of connections to adjoining work.
- D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish.
 - 1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 - 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
 - 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 - 1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

- C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As indicated on Drawings.
- E. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: 2B (bright, cold rolled).

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Roofing Corporation.
 - b. Engineered Coated Products.
 - c. Kirsch Building Products, LLC.
 - d. SDP Advanced Polymer Products Inc.

- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, 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.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch (75-mm) intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with interlocking counterflashing on exterior face, of same metal as flashing.

1. Stainless Steel: 0.016 inch (0.40 mm) thick.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cheney Flashing Company.
 - 2) Hohmann & Barnard, Inc.
 - 3) Keystone Flashing Company, Inc.
 - 4) Sandell Manufacturing Co., Inc.

B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products, Inc.
 - d. Hickman Company, W. P.
 - e. Hohmann & Barnard, Inc.
 - f. Keystone Flashing Company, Inc.
 - g. National Sheet Metal Systems, Inc.
 - h. Sandell Manufacturing Co., Inc.
2. Material: Stainless steel, 0.019 inch (0.48 mm) thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
7. Finish: Mill.

2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal

thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- H. Do not use graphite pencils to mark metal surfaces.
- 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS
- A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- C. Flashing Receivers: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch (0.40 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
 1. Stainless Steel: 0.016 inch (0.40 mm) thick.
- B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
 1. Stainless Steel: 0.016 inch (0.40 mm) thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.019 inch (0.48 mm) thick.
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:
 1. Galvanized Steel: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.
- D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[, **solder**], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.

- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 - 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of anchor and washer at 36-inch (910-mm) centers unless otherwise indicated.

3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 042000 "Unit Masonry."

- C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Copings.
- 2. Roof-edge specialties.
- 3. Roof-edge drainage systems.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
- 2. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
- 3. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
- 4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

- C. Preinstallation Conference: Conduct conference at Project site.

- 1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
- 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
- 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

D. Samples: For each type of roof specialty and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of roof specialty.
- C. Product Test Reports: For copings and roof-edge flashings, for tests performed by a qualified testing agency.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class and SPRI ES-1 tested to specified design pressure.
- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section 075423 "Thermoplastic-Polyolefin (TPO) Roofing".

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section Section 075423 "Thermoplastic-Polyolefin (TPO) Roofing".
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- C. FM Approvals' Listing: Manufacture and install copings and roof-edge specialties that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- D. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components,

failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base 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), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet (3.6 m), concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Products Company.
 - b. Drexel Metals; Carlisle Construction Materials.
 - c. Exceptional Metals.
 - d. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
 - e. Perimeter Systems; a division of SAF.
2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, thickness as required to meet performance requirements.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Extruded-Aluminum Coping Caps: Extruded aluminum, thickness as required to meet performance requirements.
 - a. Finish: Two-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
4. Corners: Factory mitered and soldered.
5. Coping-Cap Attachment Method: Snap-on or face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.
 - a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches (300 mm) wide, with integral cleats.
 - b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.3 ROOF-EDGE SPECIALTIES

A. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous formed galvanized-steel sheet cant, 0.028 inch (0.71 mm) thick, minimum, with a

continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company; "Pac-Tite WT Canted Fascia" or a comparable product by one of the following:
 - a. Architectural Products Company.
 - b. ATAS International, Inc.
 - c. Drexel Metals; Carlisle Construction Materials.
2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, 0.050 inch (1.27 mm) thick.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Extruded-Aluminum Fascia Covers: Extruded aluminum, thickness as required to meet performance requirements.
 - a. Finish: Two-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
4. Corners: Factory mitered and continuously welded.
5. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Architectural Products Company.
 2. ATAS International, Inc.
 3. Berger Building Products, Inc.
 4. Castle Metal Products.
 5. Drexel Metals; Carlisle Construction Materials.
 6. Merchant and Evans.
 7. Metal-Era, Inc.
 8. Perimeter Systems; a division of SAF.
- B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet (3.6 m), with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch (25 mm) above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 1. Aluminum Sheet: 0.032 inch (0.81 mm) thick.
 2. Gutter Profile: Style A according to SMACNA's "Architectural Sheet Metal Manual."
 3. Corners: Factory mitered and soldered.
 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.

- C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Formed Aluminum: 0.032 inch (0.81 mm) thick.
- D. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.
 - 1. Formed Aluminum: 0.032 inch (0.81 mm) thick.
- E. Splash Pans: Fabricate from the following exposed metal:
 - 1. Formed Aluminum: 0.040 inch (1.02 mm) thick.
- F. Aluminum Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.5 MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
- D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.6 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Coatings & Waterproofing Inc; Carlisle Construction Materials.
 - b. GCP Applied Technologies Inc.
 - c. Metal-Fab Manufacturing, a Drexel Metals Company.
 - d. Owens Corning.
 - 2. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F (116 deg C).
 - 3. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F (29 deg C).

- B. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 - 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- E. Aluminum Extrusion Finishes:
1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2604. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 1. Apply continuously under copings, roof-edge specialties, and reglets and counterflashings.
 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

- C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).

3.3 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.4 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
 - 1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

3.5 ROOF-EDGE SPECIALITIES INSTALLATION

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches (610 mm) apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.2 m) apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c.
 - 1. Provide elbows at base of downspouts at grade to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant.
- E. Parapet Scuppers: Install scuppers through parapet where indicated. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
 - 2. Loosely lock front edge of scupper with conductor head.

3. Seal or solder exterior wall scupper flanges into back of conductor head.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof hatches.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for metal vertical ladders for access to roof hatches.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
 - 3. Section 077100 "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.
 - 4. Section 233423 "HVAC Power Ventilators" for power roof-mounted ventilators.
 - 5. Section 237416.12 "Packaged Rooftop Air Conditioning Units 25 Ton and Below" for standard curbs specified with rooftop units.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

- C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
 1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BILCO Company (The).
 - b. Babcock-Davis.
 - c. Custom Solution Roof and Metal Products, a division of Colony Heating.
 - d. Dur-Red Products.
 - e. Milcor; Hart & Cooley, Inc.
 - f. O'Keeffe's Inc.
- B. Type and Size: Single-leaf lid, 36 by 36 inches (900 by 900 mm).
- C. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.
- D. Hatch Material: Zinc-coated (galvanized) steel sheet.
1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 2. Finish: Baked enamel or powder coat.
 3. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
1. Insulation: Polyisocyanurate board.
 - a. R-Value: 12.0 according to ASTM C 1363.
 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 5. Fabricate curbs to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.
- F. Hardware: Spring operators, hold-open arm, stainless-steel spring latch with turn handles, stainless-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: 42 inches (1060 mm) above finished roof deck.

2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches (31 mm) in diameter or galvanized-steel tube, 1-5/8 inches (41 mm) in diameter.
3. Flat Bar: Galvanized steel, 2 inches (50 mm) high by 3/8 inch (9 mm) thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches (533 mm) in diameter.
5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
9. Fabricate joints exposed to weather to be watertight.
10. Fasteners: Manufacturer's standard, finished to match railing system.
11. Finish: Manufacturer's standard baked enamel or powder coat.

a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches (1060 mm) above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8-inch- (41-mm-) diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.

a. Color: As selected by Architect from manufacturer's full range.

2.3 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.
1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
 2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 3. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.
- C. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.
- D. Steel Tube: ASTM A 500/A 500M, round tube.
- E. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
- F. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPAC2; not less than 1-1/2 inches (38 mm) thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Underlayment:
 1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
 3. Slip Sheet: Building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, rosin sized.
 4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 6. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 8. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- I. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum and stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
 - 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post according to manufacturer's written instructions.
- D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Services.
 - b. Hilti, Inc.
 - c. Tremco Incorporated.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
 - 1. Verify sealant has a VOC content of 250 g/L or less.
 - 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).

3.5 FIELD QUALITY CONTROL

- A. Engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.

- B. Related Requirements:

1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
2. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.

- B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- E. Field-Adhesion-Test Reports: For each sealant application tested.
- F. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content: Verify sealants and sealant primers comply with the following:
 - 1. Architectural sealants have a VOC content of [250] g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates have a VOC content of [250] g/L or less.
 - 3. Sealants and sealant primers for porous substrates have a VOC content of [775] g/L or less.
 - 4. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning.
 - b. GE Construction Sealants; Momentive Performance Materials, Inc.
 - c. Pecora Corporation.
 - d. Tremco Incorporated.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation.
 - b. Polymeric Systems, Inc.
 - c. Sika Corporation - Building Components.
 - d. Tremco Incorporated.
- B. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Corporation-Construction Systems.
 - b. LymTal International Inc.
- C. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. BASF Corporation-Construction Systems.
 - b. Pecora Corporation.
 - c. Polymeric Systems, Inc.
 - d. ITW Polymers Sealants North America.
- D. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation.
 - b. Sika Corporation – Building Components.
 - c. Tremco Incorporated.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Tremco Incorporated.

2.5 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Bostik; Arkema.
 - b. Pecora Corporation.
 - c. Sika Corporation - Building Components.

2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Pecora Corporation.
 - b. Sherwin-Williams Company (The).
 - c. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet (300 m) of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.

- d. Joints in stone paving units.
 - e. Tile control and expansion joints.
 - f. Joints between different materials listed above.
 - g. Other joints as indicated on Drawings.
2. Joint Sealant: Urethane, M, P, 50, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Joints in glass unit masonry assemblies.
 - f. Joints in exterior insulation and finish systems.
 - g. Joints between metal panels.
 - h. Joints between different materials listed above.
 - i. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - j. Control and expansion joints in ceilings and other overhead surfaces.
 - k. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in brick flooring.
 - d. Control and expansion joints in tile flooring.
 - e. Other joints as indicated on Drawings.
 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of unit masonry concrete walls and partitions.
 - d. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Acrylic latex.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Butyl-rubber based.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Acoustical-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
1. Verify sealant has a VOC content of 250 g/L or less.
 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hilti, Inc.
 - b. Pecora Corporation.
 - c. USG Corporation.
 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with

ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.
 - 2. Section 09 91 13 "Exterior Painting" for painting of exterior hollow metal doors and frames.
 - 3. Section 09 91 23 "Interior Painting" for painting of interior hollow metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Environmental Product Declaration: For each product.

3. Health Product Declaration: For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door 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. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. Pioneer Industries.
 - 4. Steelcraft; an Allegion brand.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Commercial Doors and Frames: NAAMM-HMMA 861..
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - d. Edge Construction: Continuously welded with no visible seam.
 - e. Core: Steel stiffened.
 - 3. Frames:

- a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm) for door openings 48 inches (1219 mm) or less; minimum thickness of 0.067 inch (1.7 mm) for door openings greater than 48 inches (1219 mm).
 - b. Sidelite and Transom Frames: Fabricated from same material as adjacent door frame.
 - c. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Commercial Doors and Frames: NAAMM-HMMA 861..
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.30 mm), with minimum G60 ((Z180) or)A60 (ZF180) coating.
 - d. Edge Construction: Continuously welded with no visible seam.
 - e. Core: Steel stiffened.
 - f. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 6.5 deg F x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C 1363.
 3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.7 mm), with minimum G60 ((Z180) or)A60 (ZF180) coating.
 - b. Construction: Full profile welded.
 - c. Thermally broken Frames: Provide frames with a thermal break
 4. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
- B. Construction: Full profile welded.

2.6 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.7 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.8 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.9 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - 4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 6. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.10 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.11 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
 - 1) At Bottom of Door: 3/8 inch from structural slab where no threshold or carpet.
 - 2) 1/4 inch above threshold and 1/4 inch above decorative floor finish, except carpet
 - 3) 3/4 inch from structural slab at areas to receive carpet.
 - c. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.
- 3.4 ADJUSTING AND CLEANING
- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
 - B. Remove grout and other bonding material from hollow-metal work immediately after installation.

- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 081216 - ALUMINUM FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior aluminum frames for doors installed in gypsum board partitions.
 - 2. Interior aluminum frames for glazing installed in gypsum board partitions.
 - 3. Interior aluminum doors.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: For aluminum frames:
 - 1. Include elevations, sections, and installation details for each wall-opening condition.
 - 2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
 - 3. Include locations of reinforcements and preparations for hardware.
 - 4. Include details of anchorages, joints, field splices, connections, and accessories.
 - 5. Include details of moldings, removable stops, and glazing.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard sizes

- E. Samples for Initial Selection: For each type of exposed finish.
 - 1. Include Samples of seals, gaskets, and accessories involving color selection.
- F. Samples for Verification: For each type of the following products:
 - 1. Framing Member and Finish: 12 inches (300 mm) long. Include trim.
 - 2. Corner Fabrication and Finish: 12-by-12-inch- (300-by-300-mm-) long, full-size window corner, including full-size sections of extrusions with factory-applied color finish.
 - 3. Door Finish: Manufacturer's standard-size unit, but not less than 3 inches (75 mm) square.
- G. Product Schedule: For aluminum frames. Use same designations indicated on Drawings. Coordinate with door hardware schedule and glazing.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum frames to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Frameworks Manufacturing.
 - 2. Kawneer
 - 3. RACO Interior Products, Inc.
 - 4. Wilson Partitions; a division of Acradia, Inc.
- B. Source Limitations: Obtain aluminum frames and frame-manufacturer's doors from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- 1. Oversize Fire-Rated Frames: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that frames comply with standard construction requirements for tested and labeled fire-rated frames except for size.

2.3 COMPONENTS

- A. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

- B. Aluminum Framing: ASTM B 221 (ASTM B 221M), with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch (1.6 mm) thick.
- C. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.
- D. Glazing Frames: Extruded aluminum, for indicated glass thickness.
- E. Door Tracks: Extruded aluminum where exposed, sized to enclose sliding-door hardware, and in finish matching frame and trim finish..
- F. Trim: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick; removable, snap-in [casing trim] [glazing stops] [and] [door stops], without exposed fasteners.
 - 1. Trim Style: square.
- G. Doors: As specified in Section 081416 "Flush Wood Doors." Section 083213 "Sliding Aluminum-Framed Glass Doors."
- H. Doors: Manufacturer's standard, factory-assembled, 1-3/4-inch- (45-mm-) thick, aluminum-framed door construction.
 - 1. Door Operation: Swinging
 - 2. Stiles: Medium
 - 3. Rails: 6-inch (152-mm) top rail and 9-1/2-inch (241-mm) bottom rail.
- I. Door Finish: Match frame and trim finish.
- J. Frame and Trim Finish: Factory-applied, baked-enamel or powder-coat finish
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
- B. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals in grey color.
- C. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated; in grey
- D. Glass: As specified in Section 088000 "Glazing."
- E. Door Hardware: As specified in Section 087100 "Door Hardware"

2.5 FABRICATION

- A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.
- B. Factory prepare aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware".
 - 1. Locate hardware cutouts and reinforcements as required by fire-rated label for assembly.
- C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
 - 1. Locate removable stops on the inside of spaces accessed by keyed doors.
- D. Fabricate components to allow secure installation without exposed fasteners.

2.6 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that wall thickness does not exceed standard tolerances allowed by throat size of indicated aluminum frame.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install aluminum frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer's written instructions.

- B. Install frame components in the longest possible lengths with no piece less than 48 inches (1220 mm); components [96 inches (2450 mm)] or shorter shall be one piece.
 - 1. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
 - 2. Secure clips to extruded main-frame components and not to snap-in or trim members.
 - 3. Do not leave screws or other fasteners exposed to view when installation is complete.
- C. Glass: Install glass according to Section 088000 "Glazing" and aluminum-frame manufacturer's written instructions.
- D. Doors: Install doors aligned with frames and fitted with required hardware.
- E. Door Hardware: Install according to Section 087100 "Door Hardware" and aluminum-frame manufacturer's written instructions.

3.3 ADJUSTING

- A. Inspect installation, correct misalignments, and tighten loose connections.
- B. Doors: Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer.
- C. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 & 610.
- D. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches (1220 mm) as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 081216

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for metal frames.
2. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.
3. Section 087100 "Door Hardware" for flush wood door hardware.
4. Section 088000 "Glazing" for glass requirements.
5. Divisions 26 Electrical and 28 Electronic Safety and Security for wiring to electrified hardware components and security components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples for Initial Selection: For factory-finished doors.

E. Samples for Verification:

1. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.

- b. Provide Samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.6 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Algoma Hardwoods, Inc.
 2. Eggers Industries.
 3. Graham Wood Doors; ASSA ABLOY Group company.
 4. Marshfield DoorSystems, Inc.
 5. Oshkosh Door Company.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- B. Certified Wood: Wood doors shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
- C. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- E. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

2.3 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Faces: MDO.
 - a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
3. Exposed Vertical Edges: Any closed-grain hardwood.
4. Core: Structural composite lumber.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
6. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099123" Interior Painting."

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards".
 3. Finish: WDMA TR-6 catalyzed polyurethane.
 4. Staining: As selected by Architect from manufacturer's full range.
 5. Effect: Open-grain finish.
 6. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."

- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 31 13 - ACCESS 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.
- C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acudor Products, Inc.
 - 2. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - 3. Karp Associates, Inc.
 - 4. Larsens Manufacturing Company.
 - 5. MIFAB, Inc.
 - 6. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - 7. Nystrom, Inc.
 - 8. Williams Bros. Corporation of America (The).

2.3 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
 - 1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 - 2. Locations: Wall and ceiling.

3. Door Size: As indicated on Drawings or, if not indicated, as directed by Architect.
4. Uncoated Steel Sheet for Door: Nominal , 16 gage, factory primed.
5. Frame Material: Same material, thickness, and finish as door.
6. Latch and Lock: Prepared for mortise cylinder, tied into master key system, with interior release.

B. Flush Access Doors with Concealed Flanges:

1. Description: Face of door flush with frame; with concealed flange for gypsum board or plaster installation, as indicated, and concealed hinge.
2. Locations: Wall and ceiling.
3. Door Size: As indicated on Drawings or, if not indicated, as directed by Architect.
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
5. Frame Material: Same material and thickness as door.
6. Latch and Lock: Prepared for mortise cylinder, tied into master key system, with interior release.

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 2. Keys: Furnish two keys per lock and key all locks alike.
 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.6 FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

SECTION 083213 - SLIDING ALUMINUM-FRAMED GLASS DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes sliding aluminum-framed glass doors for interior locations.
- B. Related Requirements:
 - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units on the building exterior.
 - 2. Section 087100 "Door Hardware" for hardware not specified in Section 083213.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
- B. Shop Drawings: For sliding aluminum-framed glass doors.
 - 1. Include plans, elevations, sections, and details.
 - 2. Detail attachments to other work, and between units, if any.
 - 3. Include hardware and required clearances.
- C. Sustainable Design Submittals:
 - 1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
 - 2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
- D. Samples: For each exposed product and for each color specified, 12-inch-long (300-mm-long) section with weather stripping, glazing bead, and factory-applied color finish.
- E. Samples for Verification: For sliding aluminum-framed glass doors and components required, prepared on Samples of size indicated below:
 - 1. Main Framing Member: 12-inch-long (300-mm-long) section with weather stripping, glazing bead, and factory-applied color finish.

2. Hardware: Full-size units with factory-applied finish.

F. Product Schedule: For sliding aluminum-framed glass doors.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer.

B. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating sliding aluminum-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to sliding aluminum-framed glass door manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of sliding aluminum-framed glass doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Failure to meet performance requirements.
- b. Structural failures including excessive deflection.
- c. Faulty operation of movable panels and hardware.
- d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period:

- a. Sliding Door: Five years from date of Substantial Completion.
- b. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
1. LaCantina Doors, Inc., 1875 Ord Way, Oceanside, CA 92056. ASD. Telephone: (888) 221-0141. Fax: (760) 734-1591. Website: www.lacantindoors.com. Email: info@lacantindoors.com
 2. Western Integrated Materials Inc., 3310 E 59th St, Long Beach, CA 90805, Aluminumdoorframes.com, (800) 835 7391
 3. Special-Lite, 860 Williams St. Decatur, MI 49045., special-lite.com, (800) 821 6531
- B. Source Limitations: Obtain sliding aluminum-framed glass doors from single source from single manufacturer

2.2 PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
1. Product Certification: AAMA certified with label attached to each door.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
1. Minimum Performance Class: Class CW.
 2. Minimum Performance Grade: Grade 25.
- C. Sound Transmission Class (STC): Rated for not less than 28 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

2.3 SLIDING ALUMINUM-FRAMED GLASS DOORS

- A. Configuration: Complete sliding door system including head, side jambs, thresholds and aluminum sliding panels to sizes indicated on the Drawings.
- B. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Panel: Extruded aluminum stile and rail panels with standard one lite
 - a. Stile and Rail 2 3/4" x 1 3/4"
 2. Frame and Sill: Extruded aluminum
 - a. Frame and threshold width: See drawings.

- C. Threshold and Sill Cap/Track: Provide extruded-aluminum threshold and track of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated; with manufacturer's standard finish.

- 1. Low-Profile Floor Track: ADA-ABA compliant.

2.4 GLAZING

- A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal. Comply with requirements indicated in Section 088000 "Glazing."

- 1. Glass: ASTM C 1036, Type 1, q3, Category II safety glass complying with testing requirements in 16 CFR 1201.
 - 2. Tint: Clear.

2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum complying with AAMA 907 and designed to smoothly operate, tightly close, and securely lock sliding aluminum-framed glass doors.

- B. Door Pulls: Provide manufacturer's standard pull.

- 1. Color and Finish: As selected by Architect from manufacturer's full range.

- C. Lock: Install manufacturer's keyed cylinder lock and locking device on each movable panel, lockable from the inside and outside. Adjust locking device to allow unobstructed movement of the panel across adjacent panel in the direction indicated.

- 1. Keying System: Keyed to match other building entrances.

2.6 ACCESSORIES

- A. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components.

- 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

- B. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for sliding aluminum-framed glass doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

2.7 FABRICATION

- A. Fabricate sliding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- B. Fabricate sliding aluminum-framed glass doors that are reglazable without dismantling panel framing.
- C. Weather Stripping: Provide full-perimeter weather stripping for each door panel.
- D. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to exterior.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- F. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory where practical and possible for applications indicated. Comply with requirements in Section 088000 "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.

2.8 GENERAL FINISH REQUIREMENTS

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

2.9 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight sliding aluminum-framed glass door installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.
- B. Install sliding aluminum-framed glass doors level, plumb, square, true to line, without distortion, without warp or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- D. Install sliding aluminum-framed glass doors and components to drain condensation, water penetrating joints, and moisture migrating within doors to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Lubricate hardware and moving parts.
- B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and a weathertight closure. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

- C. Clean exposed surfaces immediately after installing sliding aluminum-framed glass doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect sliding aluminum-framed glass door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact sliding aluminum-framed glass door surfaces, remove contaminants immediately according to manufacturer's written instructions.
- F. Refinish or replace sliding aluminum-framed glass doors with damaged finishes.
- G. Replace damaged components.

END OF SECTION 083213

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Exterior storefront framing.
- 2. Storefront framing for window walls.
- 3. Exterior and interior manual-swing entrance doors and door frame units.

- B. Related Requirements: Requirements that relate to this section are included but not limited to the sections below.

- 1. Division 1 sections for:
 - a. 01 74 19 – Construction Waste Management and Disposal.
 - b. 01 81 13 – LEED BD+C Version 4.0, Requirements.
- 2. Division 7 Section for:
 - a. 079000 Joint Protection for Sealants.
- 3. Division 8 sections for:
 - a. 08 71 00 – Door Hardware.
 - b. 08 81 00 – Glass Glazing
- 4. Division 26 sections for:
 - a. 26 05 13 – Wire And Cable.
 - b. 26 05 31 – Boxes.
 - c. 26 05 33 – Conduits
- 5. Division 28 Section for:
 - a. 28 05 00 – Basic Electronic Safety and Security System Requirements

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.
- C. Product test reports.
- D. Field quality-control reports.
- E. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Warranty: Submit written warranty signed by the manufacturer, installer, and contractor, agreeing to repair or replace defective materials or workmanship (including glazing) during the following period beginning at the date of substantial completion.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Water penetration through fixed glazing and framing areas.
 - d. Failure of operating components.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings .
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inch and to 1/240 of clear span plus 1/4 inch (19 mm) for spans greater than 13 feet 6 inch (4,115 mm) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 2. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

- a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10] seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa) 6.24 lbf/sq. ft. (300 Pa)
 2. Entrance Doors:
 - a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 lbs/sq. ft. (575 Pa)
 2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.32 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
 3. It is the intent that excessive condensation will not occur on the indoor face of the Work with the heating and ventilation system in operation and under the following conditions. Fabricate, assemble and erect the Work to achieve and maintain this design intention.
 - a. Glass: Minimum 60 CRF
 - b. Metal Frame: Minimum 70 CRF.
 - c. Outdoor:
 - 1) Ambient temperature of 0 degrees F;

- 2) Wind Speed: 15 mph (24.15 km / hr) wind.
 - d. Indoor:
 - 1) Ambient temperature of 72 degrees F;
 - 2) Relative Humidity: 50% R.H.
 - e. Excessive condensation is defined as water, ice or frost on more than 10% of the interior surface of any module or component of the wall or the accumulation of uncontrolled flow of water from condensation or melted frost on the wall at any location. An interior surface of any module is any surface other than an exterior surface.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
- 1. Ambient Temperature Change (Range):
 - a. Range Fahrenheit: 110 deg F (-5 deg F to 105 deg F)
 - 2. Metal Temperature Change (Range):
 - a. Range Fahrenheit: 185 deg F (-5 deg F to 180 deg F)

2.2 MANUFACTURERS

- A. Storefront framing system. Subject to compliance with requirements, provide products by one of the following:
 - 1. Kawneer Company, Inc.:
 - 2. Oldcastle Building Envelope:
 - 3. EFCO Corporation
 - 4. Wausau Window and Wall systems:
 - 5. Tubelite Inc.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front .
 - 4. Finish: High-performance organic finish (Exterior).
 - 5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 1. Door Construction: 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch (3.2-mm), extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 2. Door Design: Wide stile; 5-inch (127-mm) nominal width .
 3. Glazing Stops and Gaskets: Square snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.
 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- C. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.

2. Exterior Hinges: Stainless steel, with stainless-steel pin.
 3. Quantities:
 - a. For doors up to 87 inches (2210 mm) high, provide three hinges per leaf.
 - b. For doors more than 87 and up to 120 inches (2210 and up to 3048 mm) high, provide four hinges per leaf.
- D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- E. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- F. Cylinders: As specified in Section 087100 "Door Hardware."
1. Keying: to be furnished by Owner.
- G. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- H. Operating Trim: BHMA A156.6.
- I. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- J. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- K. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- L. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- M. Weather Stripping: Manufacturer's standard replaceable components.
1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- N. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- O. Silencers: BHMA A156.16, Grade 1.
- P. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
 - 1. Verify sealant has a VOC content of 250 g/L or less.
 - 2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish (Interior): AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range .
- B. High-Performance Organic Finish (Exterior): Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70percentPVDForFEVEresin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range .

2.10 SOURCE QUALITY CONTROL

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

- 1. Comply with manufacturer's written instructions.
- 2. Do not install damaged components.
- 3. Fit joints to produce hairline joints free of burrs and distortion.
- 4. Rigidly secure no movement joints.
- 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- 6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

- 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
- 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

- 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
- 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

- B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
2. Section 081416 "Flush Wood Doors".
3. Section 083113 "Access Doors and Frames" for access door hardware, except cylinders.
4. Section 087113 "Automatic Door Operators" for low-energy power operators and low-energy power-assist operators.
5. Section 281300 "Access Control" for access control devices installed at door openings and provided as part of a security system.
6. Section 281600 "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion-detection system.
7. Section 283111 "Digital, Addressable Fire-Alarm System" for connections to building fire-alarm system.

1.3 COORDINATION

- A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.

1. Cast anchoring inserts into concrete.

- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with Electrical Contractor for selection and connections to power supplies and building safety and security systems. Hardware supplier responsible to provide hardware required for a functional opening.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant.
- B. Keying Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant, Architect, and Owner.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Process for delivery of keys.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For electrified door hardware.
 - 1. Include diagrams for power, signal, and control wiring.
 - 2. Include details of interface of electrified door hardware and building safety and security systems.
- C. Samples for Initial Selection: For each type of exposed finish.
- D. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware

schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - e. Fastenings and other installation information.
 - f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - g. Mounting locations for door hardware.
 - h. List of related door devices specified in other Sections for each door and frame.

- E. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of electrified door hardware.
 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.
- C. Parts List.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish Extra Material: Provide and label one of each hardware item to owner at substantial completion.
- B. Special tools required for hardware maintenance.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
 - 1. Scheduling Responsibility: Preparation of door hardware and keying schedule.
 - 2. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project. Coordinate to obtain final wiring diagrams prior to electrical rough-in.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Install final cores. Deliver keys and key control system to Owner.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design", ICC A117.1, and 2018 Illinois Accessibility Code.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 FABRICATION

A. General:

1. Hand of door: The Drawings show the direction of slide, swing, or hand of each door leaf. Provide each item of hardware for proper installation and operation of the door swing as shown.
2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels.
3. Base Metals: Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by FS FF-H-106, FS FF-H-111, FS FF-H-116 and FS FF-H-121. Do not provide "optional" materials or forming methods for those indicated, except as otherwise specified.
4. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
5. Provide screws for installation with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
6. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
7. Fire-Rated Applications:
 - a. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
8. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
9. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.4 FINISHES

- A. Hardware Finish: Exposed surfaces of hardware shall have ANSI A 156.18 / BHMA finishes as specified.
- B. In general, all items not otherwise indicated shall be finish BHMA 630 (satin stainless steel) in sets.

BHMA	Nearest U.S.		
Code	Finish Description	Base Material	Equivalent
600	Primed for painting	Steel	USP
605	Bright Brass	Brass	US3
606	Satin Brass	Brass	US4
612	Satin Bronze	Bronze	US10
613	Oxidized Satin Bronze Oil Rubbed	Bronze	US10B
618	Bright Nickel Plated	Brass, Bronze	US14
619	Satin Nickel Plated	Brass, Bronze	US15
622	Flat Black Coated	Brass, Bronze	US19
624	Dark Oxidized Statuary Bronze	Bronze	US20A
625	Bright Chromium Plated	Brass, Bronze	US26
626	Satin Chromium Plated	Brass, Bronze	US26D
628	Satin Aluminum	Aluminum	US28
629	Bright Stainless Steel	Stainless Steel	US32
630	Satin Stainless Steel	Stainless Steel	US32D
633	Plated Satin Brass	Steel	US4
637	Flat Black	Steel	US19
639	Plated Satin Bronze	Steel	US10
640	Plated Oxidized Satin Bronze Oil Rubbed	Steel	US10B
650	Plated Dark Oxidized Statuary Bronze	Steel	US20A
651	Bright Chromium Plated	Steel	US26
652	Satin Chromium Plated	Steel	US26D
689	Painted	Plastic	AL
690	Painted	Plastic	STAT
691	Painted	Plastic	LTBRZ

- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 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.

2.5 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.

1. Door hardware is scheduled in Part 3.

2.6 HINGES

- A. Products shall meet or exceed requirements of the following types defined in ANSI /BHMA standard A156.1. The following types of butt hinges shall be used for the types of doors listed, except where otherwise specified.

1. Interior Doors: Type A8111 (Wrought steel, forged steel or malleable iron, full mortise, ball bearing, heavy weight) for doors. Out swinging corridor doors with lock sets shall have non-removable pins.
2. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wooden doors and frames, provide only template-produced units.
3. Screws: Provide Phillips flat-head all-purpose or machine screws for installation of units, except provide Phillips flat-head all-purpose or wood screws for installation of units into wood. Use threaded-to-the-head type screws for installation onto fire rated wood doors. Finish screw heads shall match surface of hinges, butts or pivots.
4. Finish: ANSI A 156.18 / BHMA
 - a. Non-rated Doors: BHMA 652, Satin Chromium Plated Steel
 - b. Fire-rated Doors: BHMA 652, Satin Chromium Plated Steel
 - c. Exterior Doors: BHMA 630, Satin Stainless Steel
5. Sizing Hinges:
 - a. Height of Hinge:
 - 1) Door 36 inch (914.4 mm) Wide or Less: 4-1/2 inch (114.3 mm) tall hinge.
 - 2) Door Over 36 inch (914.4 mm) to 48 inch (1219.2 mm) Wide: 5 inch (127 mm) high hinge.
 - 3) Door Over 48 inch (1219.2 mm) wide: 6 inch (152.4 mm) high hinge.
 - a) Width of Hinge:
 - b) Hinge up to 5 inch (127 mm) High: 4-1/2 inch (114.3 mm) wide hinge.
 - c) Hinge Over 5 inch (127 mm) High: 5 inch (127 mm) wide hinge.
6. Hinge Weight:
 - 1) Non-rated Doors: Standard weight.
 - 2) Fire-rated Doors up to 96 inch: Standard weight.
 - 3) Fire-rated Doors over 96 inch: Heavy weight.
7. Number of Hinges:
 - a. Doors 60 inch (1524 mm) High or Less: 2 hinges
 - b. Doors over 60 inch (1524 mm) not over 90 inch (2286 mm): 3 hinges
 - c. One (1) additional hinge for each 30 inch (762 mm) over 90 inch (2286 mm).
8. Hinge Designation:
 - a. Five (5) knuckle.
 - b. Pin
 - c. Non-rising.
 - d. Button tip, except as otherwise noted in hardware sets.

- A. Full Mortise Butt Type – Ball Bearing

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hager Companies; BB1279 or a comparable product by one of the following:

- a. Bommer Industries, Inc.
- b. Lawrence Hardware Inc.
- c. McKinney Products Company; an ASSA ABLOY Group company.

2.7 CONTINUOUS HINGES

- A. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

1. Basis-of-Design Product: Roton 780-112HD.

2.8 MECHANICAL LOCKS AND LATCHES

- A. General:

1. Locksets and latch sets shall meet or exceed requirements and certified with ANSI/BHMA A156.13.
2. Tactile Surfaces: Where required by Code, provide tactile surfaces on levers to warn visually handicapped persons.
3. Mortise locksets shall meet or exceed requirements of series 1000 Grade 1 Operational, Grade 2 Security.
4. Strikes for mortise locks and latches (including dead locks) shall conform to ANSI A115.13. Provide beveled, armored fronts for all mortise locksets and latchsets.

- B. Locks shall have all functions available in one size case, manufactured from heavy gauge steel. Cases are to be closed on all sides to protect internal parts. Locksets and latchsets shall have adjustable, beveled and armored fronts, standard 2-3/4 inch backset, convertible from one function to another, a full 3/4 inch throw anti-friction latch bolt, a 1 inch throw dead bolt with hardened steel insert.

- C. All locksets with latch bolts, regardless of trim, shall be listed by Underwriters Laboratories for A and lesser labeled doors, single or pairs.

- D. Locksets used with electric strikes shall have a solid one-piece stainless steel latch bolt.

- E. Locksets to be used on exterior doors and doors in high humidity areas shall be of non-ferrous parts and case, brass, bronze or stainless steel.

- F. Interior Lockset finish: BHMA 630 (satin stainless steel).

- G. Exterior Lockset finish: BHMA 630 (satin stainless steel).

- H. Lock trim lever, sectional type, shall be thru bolted through the lock case to assure correct alignment and proper operation.

- I. Lock Functions: As indicated in door hardware schedule.

- J. Lock Trim:

1. Description: Lever.
2. Levers: Cast.

3. Dummy Trim: Match lever lock trim and escutcheons.

K. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

L. Mortise Locks: BHMA A156.13; stamped steel case with steel or brass parts; Series 1000.

1. Basis-of-Design Product: Best Access Systems; Stanley Security Solutions, Inc., 40H Series Heavy Duty Mortise Lock, Lever and Trim style as selected by Owner.

2.9 ELECTRIC STRIKES

A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.

1. Basis-of-Design Product: Von Duprin, 6211 series.

2.10 MANUAL FLUSH BOLTS

A. General:

1. Flush bolts shall meet or exceed requirements of ANSI A156.16. Flush bolts shall be Type L24081 (ANSI A115) unless otherwise specified. Provide proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.
2. Face plates for cylindrical strikes shall be rectangular and not less than 1 inch (25.4 mm) by 2-1/2 inch (63.5 mm).
3. Provide in sets consisting of one top and one bottom bolt for each door. Bottom bolt shall have 12 inch (304.8 mm) long operating rod. Top bolt shall have 12 inch (304.8 mm) bolt for door heights up to 84 inch (2133.6 mm). For heights over 84 inch (2133.6 mm), increase bolt length so that operator is located no less than 73 inch (1828.8 mm) above floor.
4. Provide dust proof floor strikes for all floor bolts. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.
5. Finish: BHMA 652 (Satin chromium plated steel).
6. Provide pairs of non-rated pairs of doors with manual flushbolt and pairs of fire-rated pairs with automatic flushbolts and coordinators).
7. Provide one manufacturer for all flush bolts.

B. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.

- b. Allegion plc.
- c. Hiawatha, Inc; a division of the Activar Construction Products Group.
- d. Trimco.

2.11 EXIT DEVICES

A. General:

- 1. Exit devices shall meet or exceed requirements and certified with ANSI/BHMA A156.3, Grade 1; functions for each opening are scheduled in hardware sets.
- 2. Provide flat bottom strikes for vertical rod exit devices in interior of building.
- 3. Finish: BHMA 630 (satin stainless steel)
- 4. Provide cylinder dogging for all non-rated exit devices.
- 5. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.
- 6. Trim: Trim shall be through-bolted to the lock stile case. Levers on outside control shall match the lever design of locksets used on the Project.
- 7. Cylinders: To match Owner's existing System.
- 8. Basis of Design Product: Von Duprin "98 Series".

2.12 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1, 7-pin, permanent cores; face finished to match lockset.
 - 1. Core Type: Interchangeable.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.13 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
 - 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
 - b. Re-key Owner's existing master key system into new keying system.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

- a. Notation: "DO NOT DUPLICATE."

2.14 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lund Equipment Co., Inc.
 - b. MMF Industries.
 - c. Telkee Inc.; Glen Riddle, PA
 2. Wall-Mounted Cabinet: cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
- B. Key Lock Boxes: Designed for storage of two keys.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Knox Company.

2.15 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Astragals: BHMA A156.22.

2.16 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 1. Basis-of-Design Product: LCN 4040XP Series.

2.17 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.

- B. Convex Wall Stop:
 - 1. Finish: BHMA 626 (Satin chromium plated brass or bronze).
 - 2. Cast with convex bumper.
 - 3. Wood Blocking: Provide in walls for stops as specified in Division 6.
 - 4. Lead Expansion Shields: Provide in masonry and concrete walls for stops.
 - 5. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Ives WS402
 - b. Rockwood 400
 - c. Trimco 1270cxcp

2.18 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.
 - 1. Finish: BHMA 630 (Satin stainless steel).
 - 2. Non-friction hold open.
 - 3. Size stop to width of door.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Glynn-Johnson 900 series.
 - b. Rixson 9 series.
 - c. Sargent 590 series.

2.19 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
 - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
 - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
 - 3. Gasketing on Double Doors: 0.50 cfm per foot (0.000774 cu. m/s per m) of door opening.
- C. Finish: Color as selected by Architect from manufacturer's full line.
- D. General:
 - 1. Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - a. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - b. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - c. Door Bottoms: Apply to bottom of door, forming seal with floor when door is closed.
 - d. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.
 - e. Single doors: Provide gasketing at head and jambs, and bottom with threshold.

- f. Pair of doors: Provide gasketing at head and jambs, meeting stiles, and bottom with threshold.
 - g. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated based on testing according to UL 1784.
 - h. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.
 - i. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency for sound ratings required, based on testing according to ASTM E 108.
- E. Exterior Door Gasketing for hinge doors:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Head, Jambs, and Meeting Stiles:
 - 1) National Guard 135N
 - 2) Pemko 303AS
 - 3) Reese 678C
 - 4) Zero 8303A
 - b. Bottom:
 - 1) National Guard 200NA
 - 2) Pemko 315CN
 - 3) Reese 772A
 - 4) Zero 139AA
 - c. Threshold:
 - 1) National Guard 8425
 - 2) Pemko 253x3AFG
 - 3) Reese S473A
 - 4) Zero 626A
- F. Fire / Smoke Door Gasketing:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Head, Jambs, and Meeting Stiles:
 - 1) National Guard 5020B
 - 2) Pemko S773
 - 3) Reese 797
 - 4) Zero 188S
 - b. Bottom – Brush Sweep:
 - 1) National Guard 600A
 - 2) Pemko 18061CNB
 - 3) Reese 964C
 - 4) Zero 8193AA
- G. Sound Seal Gasketing:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Head and Jambs:
 - 1) National Guard 5050
 - 2) Pemko S88D
 - 3) Reese 797
 - 4) Zero 188S

- H. Weather Sweeps: Manufacturer's standard exterior door bottom sweep with concealed fasteners on mounting strip.

2.20 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Furnished by storefront entrance manufacturer.
 - b. National Guard.
 - c. Reese.

2.21 SLIDING DOOR HARDWARE

- A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - 1. Furnished by sliding door manufacturer.

2.22 METAL PROTECTIVE TRIM UNITS (ARMOR PLATES, KICK PLATES, AND MOP PLATES)

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ives.
 - b. Rockwood.
 - c. Trimco.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
- E. Key Control System:
 - 1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
- F. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
1. Configuration: Provide one power supply for each door opening with electrified door hardware.
- G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
 3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.

- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.9 DOOR HARDWARE SCHEDULE

C SERIES: Interior Control Doors

C1: Classroom, Card reader Egress fire alarm Release Non-Fire Rated

Hinges
Lockset (Classroom)
Electric Strike (tied to fire alarm Fail safe)
Closer
Wall stop
Kick plate
Card Reader
Electric Hookup

Sequence of Operation: Door secured from public side. Door unlocked in egress direction upon activation of fire alarm.

C2: Classroom, Card reader Non-Fire Rated

Hinges
Lockset (Classroom)
Electric Strike
Closer
Wall stop
Kick plate
Card Reader
Electric Hookup

Sequence of Operation: Door secured from public side. Egress is allowed at all times.

M SERIES: Manufacturers

M1: All Hardware by Manufacturer

M2: Provide cylinder core and keys

O SERIES: Office

O1: Office Non-Fire Rated

Hinges
Lockset (Office)
Wall stop

O2: Office Non-Fire Rated

Hinges
Lockset (Office)
Overhead stop
Kick plate

P SERIES: Interior Passage

P1 Classroom Sound, Non-Fire Rated

Hinges
Lockset (Classroom)
Wall stop
Sound gasketing
Automatic door bottom

P2 Classroom Sound, Non-Fire Rated

Hinges
Lockset (Classroom)
Closer
Wall stop
Sound gasketing
Automatic door bottom

P3 Classroom Sound, Non-Fire Rated

Hinges
Lockset (Classroom)
Closer
Overhead stop
Sound gasketing
Automatic door bottom
Armor Plate
Mop Plate

P4 Classroom Sound, Non-Fire Rated

Hinges
Lockset (Classroom)
Closer
Wall stop
Sound gasketing
Automatic door bottom
Armor plate
Mop Plate

P5 Deadbolt, Sound, Non-Fire Rated

Hinges
Latchset, deadbolt Lockset
Closer
Wall stop
Sound gasketing
Automatic door bottom
Kick plate

P6 Passage, Non-Fire Rated

Hinges
Latchset, passage
OH stop
Armor plate

S SERIES: Interior Storeroom

S1: Storeroom Sound, Non-Fire Rated

Hinges
Lockset (Storeroom)
Wall stop
Sound gasketing
Automatic door bottom

S2: Storeroom Sound, Fire Rated Opening

Hinges
Lockset (Storeroom)
Closer
Wall stop
Sound gasketing
Automatic door bottom

S3: Office Non-Fire Rated

Hinges
Lockset (Office)
Wall stop
Armor plate

S4: Storeroom Non-Fire Rated

Hinges
Lockset (Storeroom)
Wall stop
Kick Plate

S5: Double Storeroom Non-Fire Rated

Hinges
Lockset (Storeroom)
Manual flush bolts
2 Overhead stop (hold open)

T SERIES: Toilet Room

T1: Privacy Non-Fire Rated

Hinges
Lockset Privacy (occupancy indicator)
Wall stop
Kick plate
Mop plate
Coat hook

X SERIES: EXTERIOR Non-Fire Rated

X1: Power Opener Exit Device

Hinges
Electric Hinge
Rim Exit Device (Classroom) electric retract (cylinder dogging)
Power Opener Closer
Position indicator coordinator
Overhead stop
Push Pull
Card Reader
Threshold
Weatherstripping
Electric Hookup
Door Contact

Sequence of Operation: Operation electrically controlled. Door normally closed and locked. Entry authorization by card reader or key to activate outside door switch. Door switch activation retracts rim device and activates power opener. Egress is allowed at all times. Inside door switch always active. Upon loss of power, door remains locked (fail secure)

X2: Vestibule Power Opener

Hinges
Power Opener Closer
Push Pull
Electric Hookup
Door Contact

Sequence of Operation: Operation electrically controlled. Door normally closed. Door opened by switch or sequenced with exterior door. Egress is allowed at all times. Inside door switch always active.

X3 Aluminum Entrance

Hinges - continuous
Lockset (Entrance)
closer
Overhead stop
Threshold
Weatherstripping
Door Contact
Sweep

X4 HM Entrance

Hinges - continuous
Lockset (Entrance)
Closer
Overhead stop
Threshold
Weatherstripping
Door Contact

X5 HM Entrance Card Reader

Hinges - continuous
Electronic key pad lockset (Entrance)
Closer
Overhead stop
Threshold
Weatherstripping
Door Contact

X6 HM Double Entrance

(2) Hinges – continuous
Lockset (Entrance)
Manual flush bolts
(1) Closer
(2) Overhead stop (hold open)
Threshold
(2) Weatherstripping
(2) Armored plates
Door Contact
(2) Sweeps
Astragal

X7 Aluminum Entrance

Hinges - continuous
Latchset, Deadbolt
Closer
Overhead stop

Threshold
Weatherstripping
Kick Plate
Door Contact

X8 Aluminum Entrance Exit Device

Hinges - continuous
Rim Exit Device (Classroom) (cylinder dogging)
Closer
Overhead stop
Pull
Threshold
Weatherstripping
Door Contact

X9 HM Storeroom

Hinges
Lockset (Storeroom)
Overhead stop
Threshold
Weatherstripping
Door Contact

END OF SECTION 087100

SECTION 087113 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Low-energy door operators for swinging doors.

1.3 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Double-Egress (Doors): A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.
- D. Double-Swing (Doors): A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.
- E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- F. For automatic door terminology, see BHMA A156.10 and BHMA A156.19 for definitions of terms.

1.4 COORDINATION

- A. Coordinate sizes and locations of recesses in concrete floors for recessed control mats that control automatic door operators. Concrete, reinforcement, and formwork requirements are specified elsewhere.
- B. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.
- C. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

- D. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies and access-control system.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Shop Drawings: For automatic door operators.

1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.
4. Include diagrams for power, signal, and control wiring.
5. Include plans, elevations, sections, and attachment details for guide rails.

- C. Samples: For each exposed product and for each color and texture specified, manufacturer's standard size.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of automatic door operator.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Certified Inspector Qualifications: Certified by AAADM.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty or sporadic operation of automatic door operator, including controls.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. LCN; Allegion plc.
- B. Source Limitations: Obtain automatic door operators, including activation and safety devices, from same manufacturer as for hardware in Section 087100 "Door Hardware."

2.2 AUTOMATIC DOOR OPERATORS, GENERAL

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and according to UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
 - 1. Emergency Breakaway: Where indicated for center-pivoted doors, provide emergency breakaway feature for reverse swing of doors. Equip system to discontinue power to automatic door operator when door is in emergency breakaway position, to return door to closed position after breakaway, and to automatically reset.

2. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
 3. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load as indicated on drawings.
- B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.
- C. Hinges: See Section 087100 "Door Hardware" for hinge type for each door that door operator shall accommodate.
- D. Housing for Overhead Concealed Operators: Fabricated from minimum 0.125-inch- (3.2-mm-) thick, extruded or formed aluminum and extending full width of door opening including door jambs to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
- E. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch- (3.2-mm-) thick, extruded or formed aluminum; manufacturer's standard width; continuous over full width of operator-controlled door opening; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- F. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- G. Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.
- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 LOW-ENERGY DOOR OPERATORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
1. Opening Force if Power Fails: Not more than 15 lbf (67 N) required to release latch if provided, not more than 30 lbf (133 N) required to manually set door in motion, and not more than 15 lbf (67 N) required to fully open door.
 2. Entrapment-Prevention Force: Not more than 15 lbf (67 N) required to prevent stopped door from closing or opening.

- C. Configuration: Operator to control single swinging door.
 - 1. Traffic Pattern: Two way.
 - 2. Operator Mounting: Surface.
- D. Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
 - 1. Adjustable opening and closing speed.
 - 2. Adjustable opening and closing force.
 - 3. Adjustable backcheck.
 - 4. Adjustable hold-open time from zero to 30 seconds.
 - 5. Adjustable time delay.
 - 6. Adjustable acceleration.
 - 7. Obstruction recycle.
 - 8. On-off/hold-open switch to control electric power to operator.
 - 9. Insert feature.
- H. Activation Device: Push-plate switch on each side of door to activate door operator.
- I. Exposed Finish: Finish matching door and frame.
 - 1. Color: As selected by Architect from full range of industry colors and color densities.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extrusions: ASTM B 221 (ASTM B 221M).
 - 2. Sheet: ASTM B 209 (ASTM B 209M).
- B. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 CONTROLS

- A. General: Provide controls, including activation and safety devices, according to BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under

normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

- B. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- C. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
- D. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
 - 1. Configuration: Square push plate with 4-by-4-inch (100-by-100-mm) junction box.
 - a. Mounting: As indicated on Drawings.
 - 2. Configuration: Rectangular push plate with 2-by-4-inch (50-by-100-mm) junction box.
 - a. Mounting: As indicated on Drawings.
 - 3. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.
 - 4. Message: International symbol of accessibility and "Push to Open."
- E. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.6 FABRICATION

- A. Factory fabricate automatic door operators to comply with indicated standards.
- B. Form aluminum shapes before finishing.
- C. Fabricate exterior components to drain condensation and water passing joints within operator enclosure to the exterior.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.
- E. Provide metal cladding, completely covering visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

2.7 ACCESSORIES

- A. Signage: As required by cited BHMA standard for type of door and its operation.
 - 1. Application Process: Operator manufacturer's standard process.

2. Provide sign materials with instructions for field application when operators are installed.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
- C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before automatic door operator installation.
- D. Verify that full-height finger guards are installed at each door with pivot hinges where door has a clearance at hinge side greater than 1/4 inch (6 mm) and less than 3/4 inch (19 mm) with door in any position.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.

1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
 2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Access-Control System: Connect operators to access-control system as specified in Section 281300 "Access Control."
- D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

- A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- C. Automatic door operators will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
1. Adjust operators on exterior doors for weathertight closure.
- B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- D. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 087113

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites, storefront framing.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 08 4113 "Aluminum-Framed Entrances and Storefronts."

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Coated glass.
 - 2. Laminated glass.
 - 3. Insulating glass.
- D. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency, and sealant testing agency.
- B. Product Certificates: For glass.
- C. Product Test Reports: For coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is

defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Oldcastle BuildingEnvelope™.
 2. Viracon, Inc.
 3. Guardian
 4. Pilkington
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 1. Obtain tinted glass from single source from single manufacturer.
 2. Obtain reflective-coated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 1. Design Wind Pressures: As indicated on Drawings.
 2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - b. Basic Wind Speed: 90 mph (40 m/s).

- c. Importance Factor: 1.0.
 - d. Exposure Category: C.
3. Design Snow Loads: As indicated on Drawings.
 4. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 5. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 6. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/100 times the short-side length or 1 inch (25 mm), whichever is less.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.

- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
 - 2. Spacer: Aluminum with black, color anodic finish.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

- A. Glass Type G-1 : Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.

3.8 LAMINATED GLASS SCHEDULE

- A. Glass Type G-2 : Clear laminated glass with two plies of heat-strengthened float glass.
 - 1. Minimum Thickness of Each Glass Ply: 6 mm.
 - 2. Interlayer Thickness: 0.030 inch (0.76 mm).
 - 3. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

- A. Glass Type GL-1 (Typical at storefront and clearstory): Low-E-coated, clear insulating glass.

1. Overall Unit Thickness: 1 inch (25 mm).
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Heat treated, where required.
4. Interspace Content: Air.
5. Indoor Lite: Heat treated, where required.
6. Low-E Coating: Pyrolytic on second surface.
7. Winter Nighttime U-Factor: 0.29 maximum.
8. Summer Daytime U-Factor: 0.27 maximum.
9. Visible Light Transmittance: 67 percent minimum.
10. Solar Heat Gain Coefficient: 0.38 maximum.
11. Safety glazing required.

B. Glass Type GL-2 (Typical at punched openings): Low-E-coated, clear insulating glass.

1. Overall Unit Thickness: 1 inch (25 mm).
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Heat treated, where required.
4. Interspace Content: Air.
5. Indoor Lite: Heat treated, where required.
6. Low-E Coating: Pyrolytic on second surface.
7. Winter Nighttime U-Factor: 0.29 maximum.
8. Summer Daytime U-Factor: 0.27 maximum.
9. Visible Light Transmittance: 54 percent minimum.
10. Solar Heat Gain Coefficient: 0.29 maximum.
11. Shading coefficient: 0.29
12. Safety glazing required.

END OF SECTION 08 80 00

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Grid suspension systems for gypsum board ceilings.

- B. Related Requirements:

- 1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Sustainable Design Submittals:

- 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

- B. Evaluation reports for embossed steel studs and tracks, firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- B. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 10 lbf/sq. ft. (480 Pa)

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
 - 3. Metal Stud thickness shall be based on delegated design; refer to Architectural Drawings for more information. All metal thicknesses listed below are minimum thickness required.
- C. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ClarkDietrich Building Systems.
 - b. MarinoWARE.
 - c. MRI Steel Framing, LLC.
 - d. Steel Network, Inc. (The).
 - 2. Steel Studs and Tracks:
 - a. Minimum Base-Metal Thickness:
 - 1) Typical: 0.0179 inch.
 - 2) Partitions Supporting Wall Mounted Casework: 0.0329 inch.
 - b. Depth: As indicated on Drawings.
 - 3. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks.
 - a. Minimum Base-Metal Thickness:
 - 1) Typical: 0.0147 inch.
 - 2) Partitions Supporting Wall Mounted Casework: 0.0220 inch.
 - b. Depth: As indicated on Drawings.

- D. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Track System: ASTM C 645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
 2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0179 inch.
- G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 1-1/2 inches or as indicated.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0179 inch.
 2. Depth: As indicated on Drawings.
- I. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: As indicated on Drawings or, if not indicated, as directed by Architect.
- D. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

2. Steel Studs and Tracks: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0179 inch.
 - b. Depth: As indicated on Drawings or, if not indicated, as directed by Architect.
 3. Embossed Steel Studs and Tracks: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0147 inch.
 - b. Depth: As indicated on Drawings or, if not indicated, as directed by Architect.
 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: [Asymmetrical] [or] [hat shaped].
 6. Minimum Base-Metal Thickness: 0.0179 inch
- E. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corporation.
 - c. USG Corporation

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building

structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 - 2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
 - 3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches (610 mm) o.c.
 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.
5. Laboratory Test Reports: For gypsum board materials, indicating compliance with requirements for mold and mildew growth resistance.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Verify ceiling and wall materials comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Regional Materials: Manufacture products within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
- C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board: ASTM C 1396/C 1396M.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Building Products; Tough Roc Regular Gypsum Wallboard
 - b. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
 - c. United States Gypsum Company; USG Sheetrock® Brand Gypsum Panels.

2. Gypsum wallboard is also available in 1/4- and 3/8-inch (6.4- and 9.5-mm) thicknesses for limited applications.
3. Thickness: As indicated.
4. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Building Products; Tough Roc Fireguard X.
 - b. National Gypsum Company; Gold Bond Brand Fire-Shield Wallboard.
 - c. United States Gypsum Company; USG Sheetrock® Brand Firecode® X Gypsum Panels.
2. Thickness: As indicated.
3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

1. Core: As indicated on Drawings.
2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
5. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

A. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Building Products; DensArmour Plus.
 - b. National Gypsum Company; eXP Interior Extreme.
 - c. United States Gypsum Company; USG Sheetrock® Brand Glass-Mat Panels Mold Tough® VHI.
2. Core: 5/8 inch (15.9 mm), Type X, 5/8 inch (15.9 mm), abuse resistant.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Georgia-Pacific Building Products; DensShield Tile Backer.
 - b. National Gypsum Company; eXP Tile Backer.
 - c. Temple-Inland Building Products by Georgia-Pacific; Green Glass Tilebacker.
 2. Core: As indicated on Drawings.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.

- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.

- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

- D. Joint Compound for Tile Backing Panels:
 - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.
 - 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- E. Acoustical Sealant: as specified in Section 07 92 19 "Acoustical Joint Sealants."
- F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 07 26 00 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.

- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Gypsum Board Type: As indicated on Drawings.
 - 2. Type X: As indicated on Drawings or Where required for fire-resistance-rated assembly.
 - 3. Ceiling Type: As indicated on Drawings.
 - 4. Glass-Mat Interior Type: All animal holding, animal testing, cage wash, bedding, and loading areas, or as otherwise indicated on Drawings.
 - 5. Skim-Coated Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
 4. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Size and location of initial access modules for acoustical panels.
 - 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Perimeter moldings.

7. Minimum Drawing Scale: 1/8 inch = 1 foot.

- B. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and work above ceilings is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Verify ceiling products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: Class A according to ASTM E 1264.
 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS ACT-1, ACT-2

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or comparable product approved by Architect by one of the following:
 - 1. Armstrong Ceiling & Wall Solutions
 - 2. CertainTeed Corporation.
 - 3. USG Corporation.
- B. Edge/Joint Detail: As indicated by manufacturer's designation.
- C. Modular Size: As indicated on Drawings.
- D. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.3 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Finish Schedule on Drawings or comparable product approved by Architect by one of the following:
 - 1. Armstrong Ceiling and Wall Solutions
 - 2. CertainTeed Corporation.
 - 3. Chicago Metallic Corporation.
 - 4. USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Cold-rolled steel.
 - 5. Cap Finish: Painted white.
- D. Narrow-Face, Uncapped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; to produce structural members with 9/16-inch- wide faces.
 - 1. Structural Classification: Heavy-duty system.
 - 2. Face Design: With 1/8-inch- wide, slotted, box-shaped flange.
 - 3. Face Finish: Painted white.
 - 4. Reveal Finish: Painted to match flange color.

- E. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.4 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch-diameter wire.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.6 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 07 9219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
 - 1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal

- in firm contact with top surface of runner flanges.
2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoplastic-rubber base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For sealants, indicating VOC content.
 - 4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
 - 5. Laboratory Test Reports: For resilient base and stair products and accessories, indicating compliance with requirements for low-emitting materials.
 - 6. Environmental Product Declaration: For each product.
 - 7. Health Product Declaration: For each product.
 - 8. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOPLASTIC-RUBBER BASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Armstrong Flooring, Inc.
 2. Flexco; Roppe Corporation.
 3. Johnsonite; a Tarkett company.
 4. Roppe Corporation.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:
 - a. Standard Cove.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Outside Corners: Preformed.
- F. Inside Corners: Preformed.
- G. Colors: As indicated on drawings.

2.3 INSTALLATION MATERIALS

- A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 1. Verify adhesives have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

- C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Remove protection at time of Substantial Completion.

END OF SECTION 096513

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete masonry units (CMUs).
 - 2. Steel and iron.
 - 3. Galvanized metal.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 2. Section 05 52 13 "Pipe and Tube Railings" for shop pipe and tube railings.

1.2 DEFINITIONS

- A. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: Match Architect's samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Portland Cement Plaster: 12 percent.
6. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, dirt, oil, shop primer if any, and other foreign substances. Clean using methods recommended in writing by paint manufacturer.
 1. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

EXTERIOR PAINTING SCHEDULE

- E. Metal Materials: Ferrous Metals:
 1. Acrylic Latex, Gloss Finish.
 - a. Primer:
 - 1) Moore: IMC Acrylic Metal Primer (M04)
 - 2) Pittsburgh: Pitt-Tech Int/Ext Primer/Finish DTM Enamel (90-712 Series)
 - 3) S-W: Pro-Cryl Universal Water Based Primer (B66-310)
 - b. First and second coats:
 - 1) Moore: IMC DTM Acrylic Gloss Enamel (M28)
 - 2) Pittsburgh: Speedhide Interior 100% Acrylic Latex 6-8534 Series)
 - 3) S-W: Super Paint Exterior High Gloss Latex Enamel (A85 Series)

F. Galvanized-Metal Substrates:

1. Latex System:

a. Prime Coat: Primer, galvanized, water based.

- 1) Benjamin Moore: IMC Acrylic Metal Primer (M04)
- 2) Pittsburgh: Pitt-Tech Int/Ext Primer/Finish DTM Enamel (90-712 Series)
- 3) Sherwin-Williams: Pro-Cryl Universal Water Based Primer (B66-310).

b. Intermediate Coat: Latex, exterior, matching topcoat.

c. Topcoat: Latex, exterior, high gloss (MPI Gloss Level 7).

- 1) Benjamin Moore: IMC DTM Acrylic Gloss Enamel (M28)
- 2) Pittsburgh: Speedhide 100% Acrylic Latex (6-8534 Series)
- 3) Sherwin-Williams: Super Paint Exterior High Gloss Latex Enamel (A85 Series)

G. CMU Substrates:

1. Latex System:

a. Prime Coat: Block filler, latex, interior/exterior.

- 1) Benjamin Moore: Coronado Super Kote 5000 Production Block Filler 958-11 (35 g/L), MPI # 4
- 2) PPG Paints: Block Filler 6-15 SpeedHide Interior/Exterior Acrylic Masonry
- 3) S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).

b. Intermediate Coat: Latex, exterior, matching topcoat.

- 1) Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141
- 2) PPG Paints: 6-900XI Series SpeedHide Exterior House and Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- 3) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.

c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5)

- 1) Benjamin Moore: Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153
- 2) PPG Paints: 6-900XI Series SpeedHide Exterior House and Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- 3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat).

END OF SECTION 09 9113

SECTION 09 9123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Steel and iron.
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Gypsum board.
 - 6. Fiberglass Faced Gypsum board.
 - 7. Exposed overhead work.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 2. Section 09 96 00 "High-Performance Coatings" for tile-like coatings.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Coatings.
 - 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: For field applications inside the building, wall paints shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Interior Flat Latex Wall Paint: 50 g/L.
 - 2. Interior Nonflat Latex Wall Paint: 150 g/L.
- D. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

- E. Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 11.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Exposed steel.
 - i. Other items as directed by Architect.
 - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

INTERIOR PAINT SCHEDULE

A. Cementitious Materials:

1. Concrete.

a. Walls: Latex, eggshell finish:

1) Primer:

a) Moore: Pristine Eco Spec Interior Latex Primer (231)

1) Min. Volume Solids: 30%, Dry Film Thickness: 0.8 mils, VOC: 50 grams/L

b) Pittsburgh: Speedhide Int/Ext Latex Alkali Resistant Primer ((6-603)

1) Min. Volume Solids: 36%, Dry Film Thickness: 1.2, VOC: 110 grams/L

c) S-W: Harmony Interior Latex Primer (B11W900)

1) Min. Volume Solids: 33%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L

2) First and Second Coats:

a) Moore: Eco Spec Interior Eggshell Enamel (223)

1) Min. Volume Solids: 36%, Dry Film Thickness: 1.4 mils, VOC: 50 grams/L

b) Pittsburgh: Pure Performance Interior Eggshell Latex (9-411 Series)

1) Min. Volume Solids: 37%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L

c) S-W: Harmony Interior Latex Eg-Shel (B9 Series)

1) Min. Volume Solids: 39%, Dry Film Thickness: 1.6 mils, VOC: 0 grams/L

2. Concrete Masonry Units:

a. Two-Part Marine Grade Epoxy, Egg Shell Finish:

1) Block Filler / Primer:

a) S-W: Loxon Block Surfacer (A24W200)

b) Or Equal

2) First and Second Coat:

a) S-W: Tile Clad Marine Epoxy Paint.

b) Or Equal

B. Metal Materials:

1. Ferrous Metals:

- a. Latex, semi-gloss finish:
 - 1) Primer:
 - a) Moore: IronClad Latex Low Lustre Metal and Wood "Enamel (363)
 - 1) Min. Volume Solids: 41%, Dry Film Thickness: 1.6 mils, VOC: 380 grams/L
 - b) Pittsburgh: Pit-Tech Int/Ext Primer/Finish DTM Industrial Enamel (90-712 Series)
 - 1) Min. Volume Solids: 38%, Dry Film Thickness: 2 mils, VOC: 116 grams/L
 - c) S-W: Pro-Cryl Universal Water Based Primer (B66-310)
 - 1) Min. Volume Solids: 39%, Dry Film Thickness: 1.3 mils, VOC: 110 grams/L
 - 2) First and Second Coats:
 - a) Moore: Pristine Eco Spec Interior Latex Semi-Gloss Enamel (224)
 - 1) Min. Volume Solids: 36%, Dry Film Thickness: 1.4 mils, VOC: 50 grams/L
 - b) Pittsburgh: Pure Performance Interior Semi-Gloss Latex (9-510 Series)
 - 1) Min. Volume Solids: 37%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Semi-Gloss (B10 Series)
 - 1) Min. Volume Solids: 40%, Dry Film Thickness: 1.6 mils, VOC: 0 grams/L
 - b. Latex, flat finish:
 - 1) Primer:
 - a) Moore: IronClad Latex Low Lustre Metal and Wood "Enamel (363)
 - 1) Min. Volume Solids: 41%, Dry Film Thickness: 1.6 mils, VOC: 380 grams/L
 - b) Pittsburgh: Pit-Tech Int/Ext Primer/Finish DTM Industrial Enamel (90-712 Series)
 - 1) Min. Volume Solids: 38%, Dry Film Thickness: 2 mils, VOC: 116 grams/L
 - c) S-W: Pro-Cryl Universal Water Based Primer (B66-310)
 - 1) Min. Volume Solids: 39%, Dry Film Thickness: 1.3 mils, VOC: 110 grams/L
 - 2) First and Second Coat:
 - a) Moore: Eco Spec Interior Latex Flat (219)
 - 1) Min. Volume Solids: 34%, Dry Film Thickness: 1.2 mils, VOC: 50 grams/L
 - b) Pittsburgh: Pure Performance Interior Latex Primer (9-110 Series)
 - 1) Min. Volume Solids: 36%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Flat (B5 Series)
 - 1) Min. Volume Solids: 42%, Dry Film Thickness: 1.7 mils, VOC: 0 grams/L
 - c. Two-Part Marine Grade Epoxy, egg shell finish:
 - 1) Primer:
 - a) S-W: Epoxy primer (to match finish color)
 - 2) First and Second Coat:
 - a) S-W: Tile Clad Marine Epoxy Paint.
2. Zinc-Coated Metals:
 - a. Latex, semi-gloss finish:
 - 1) Primer:
 - a) Moore: IronClad Latex Low Lustre Metal and Wood "Enamel (363)
 - 1) Min. Volume Solids: 41%, Dry Film Thickness: 1.6 mils, VOC: 380 grams/L
 - b) Pittsburgh: Pit-Tech Int/Ext Primer/Finish DTM Industrial Enamel (90-712 Series)
 - 1) Min. Volume Solids: 38%, Dry Film Thickness: 2 mils, VOC: 116 grams/L
 - c) S-W: Pro-Cryl Universal Water Based Primer (B66-310)
 - 1) Min. Volume Solids: 39%, Dry Film Thickness: 1.3 mils, VOC: 110 grams/L
 - 2) First and Second Coats:
 - a) Moore: Pristine Eco Spec Interior Latex Semi-Gloss Enamel (224)

- 1) Min. Volume Solids: 36%, Dry Film Thickness: 1.4 mils, VOC: 50 grams/L
 - b) Pittsburgh: Pure Performance Interior Semi-Gloss Latex (9-510 Series)
 - 1) Min. Volume Solids: 37%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Semi-Gloss (B10 Series)
 - 1) Min. Volume Solids: 40%, Dry Film Thickness: 1.6 mils, VOC: 0 grams/L
 - b. Latex, flat finish:
 - 1) Primer:
 - a) Moore: IronClad Latex Low Lustre Metal and Wood "Enamel (363)
 - 1) Min. Volume Solids: 41%, Dry Film Thickness: 1.6 mils, VOC: 380 grams/L
 - b) Pittsburgh: Pit-Tech Int/Ext Primer/Finish DTM Industrial Enamel (90-712 Series)
 - 1) Min. Volume Solids: 38%, Dry Film Thickness: 2 mils, VOC: 116 grams/L
 - c) S-W: Pro-Cryl Universal Water Based Primer (B66-310)
 - 1) Min. Volume Solids: 39%, Dry Film Thickness: 1.3 mils, VOC: 110 grams/L
 - 2) First and Second Coat:
 - a) Moore: Eco Spec Interior Latex Flat (219)
 - 1) Min. Volume Solids: 34%, Dry Film Thickness: 1.2 mils, VOC: 50 grams/L
 - b) Pittsburgh: Pure Performance Interior Latex Primer (9-110 Series)
 - 1) Min. Volume Solids: 36%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Flat (B5 Series)
 - 1) Min. Volume Solids: 42%, Dry Film Thickness: 1.7 mils, VOC: 0 grams/L
- C. Gypsum Board:
 - 1. Walls:
 - a. Latex, eggshell finish
 - 1) Primer:
 - a) Moore: Pristine Eco Spec Interior Latex Primer (231)
 - 1) Min. Volume Solids: 30%, Dry Film Thickness: 0.8 mils, VOC: 0 grams/L
 - b) Pittsburgh: Pure Performance Interior Latex Primer (9-2)
 - 1) Min. Volume Solids: 34%, Dry Film Thickness: 1.2 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Primer (B11W900)
 - 1) Min. Volume Solids: 33%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - 2) First and Second Coats:
 - a) Moore: Eco Spec Interior Eggshell Enamel (223)
 - 1) Min. Volume Solids: 36%, Dry Film Thickness: 1.4 mils, VOC: 1 grams/L
 - b) Pittsburgh: Pure Performance Interior Eggshell Latex (9-411 Series)
 - 1) Min. Volume Solids: 37%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Eg-Shel (B9 Series)
 - 1) Min. Volume Solids: 39%, Dry Film Thickness: 1.6 mils, VOC: 0 grams/L
 - 2. Ceiling:
 - a. Vinyl Acrylic, flat finish:
 - 1) Primer:
 - a) Moore: Pristine Eco Spec Interior Latex Primer (231)
 - 1) Min. Volume Solids: 30%, Dry Film Thickness: 0.8 mils, VOC: 50 grams/L
 - b) Pittsburgh: Pure Performance Interior Latex Primer (9-2)
 - 1) Min. Volume Solids: 34%, Dry Film Thickness: 1.2 mils, VOC: 0 grams/L
 - c) S-W: Harmony Interior Latex Primer (B11W900)
 - 1) Min. Volume Solids: 33%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
 - 2) First and Second Coat:
 - a) Moore: Eco Spec Interior Latex Flat (219)

- 1) Min. Volume Solids: 34%, Dry Film Thickness: 1.2 mils, VOC: 50 grams/L
- b) Pittsburgh: Pure Performance Interior Latex Primer (9-110 Series)
 - 1) Min. Volume Solids: 36%, Dry Film Thickness: 1.3 mils, VOC: 0 grams/L
- c) S-W: Harmony Interior Latex Flat (B5 Series)
 - 1) Min. Volume Solids: 42%, Dry Film Thickness: 1.7 mils, VOC: 0 grams/L

D. Fiberglass Faced Gypsum

1. Walls:

- a. Epoxy, MPI G6 finish
 - 1) Primer
 - a) Benjamin Moore: Eco Spec WB Interior Latex Primer (N372/F372)
 - b) PPG Architectural: High Hide Interior Primer Sealer (1000G)
 - c) Sherwin-Williams: Harmony Interior Latex Primer (B11W01500)
 - 2) First and Second Coat:
 - a) Benjamin Moore: Corotech Polyamide Epoxy (V450)
 - b) PPG Architectural: HPC High Gloss Epoxy (95501 95506)
 - c) Sherwin-Williams: Pro Industrial High Performance Epoxy (B67W201)

2. Ceiling:

- a. Epoxy, MPI G4 Finish
 - 1) Primer
 - a) Benjamin Moore: Eco Spec WB Interior Latex Primer (N372/F372)
 - b) PPG Architectural: High Hide Interior Primer Sealer (1000G)
 - c) Sherwin-Williams: Harmony Interior Latex Primer (B11W01500)
 - 2) First and Second Coat:
 - a) Benjamin Moore: Corotech Polyamide Epoxy (V450)
 - b) PPG Architectural: HPC High Gloss Epoxy (95501 95506)
 - c) Sherwin-Williams: Pro Industrial High Performance Epoxy (B67W201)

E. Exposed Overhead Work:

1. Ceiling:

- a. Acrylic, flat finish:
 - 1) Primer:
 - a) Moore: Moore's IMC Sweep-Up Spray Latex Flat (M53)
 - 1) Min. Volume Solids: 40%, Dry Film Thickness: 2 mils, VOC: 37 grams/L
 - b) Pittsburgh: Pitt-Tech Int/Ext Primer/Finish DTM Industrial Enamel (90-712 Series)
 - 1) Min. Volume Solids: 38%, Dry Film Thickness: 2.0 mils, VOC: 116 grams/L
 - c) S-W: Pro-Cryl Universal Water Based Primer (B66-310)
 - 1) Min. Volume Solids: 39%, Dry Film Thickness: 1.3 mils, VOC: 110 grams/L
 - 2) First Coat:
 - a) Moore: Moore's IMC Sweep-Up Spray Latex Flat (M53)
 - 1) Min. Volume Solids: 40%, Dry Film Thickness: 2 mils, VOC: 37 grams/L
 - b) Pittsburgh: Speedhide Interior Dry Fog Spray Paint Flat Latex (6-715 Series)
 - 1) Min. Volume Solids: 32%, Dry Film Thickness: 2 mils, VOC: 19 grams/L
 - c) S-W: Waterborne Acrylic Dryfall (B42 Series)
 - 1) Min. Volume Solids: 42%, Dry Film Thickness: 3 mils, VOC: 58 grams/L

END OF SECTION 09 9123

SECTION 09 96 00.01 – HIGH PERFORMANCE COATING SYSTEMS (LANDSCAPE)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work under this section consists of surface preparation, priming and finishing work necessary to complete the painting work indicated or reasonably implied on Drawings for steel.
- B. Use high performance coating systems specified in this section to coat surfaces as indicated.

1.2 REFERENCES

- A. Publications listed herein are part of this specification to extent referenced.
- B. Related Requirements:
 - 1. Section 05 50 00 “Metal Fabrications.”
- C. Steel Structures Painting Council:
 - 1. SSPC SP-1 Specification for Solvent Cleaning
 - 2. SSPC SP-6 Commercial Blast Cleaning
 - 3. SSPC PA-1 Painting Application Specification
- D. American Society for Testing and Materials (ASTM)
 - 1. ASTM D 4060 Standard Test Method for Abrasion Resistance.
 - 2. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 3. ASTM D 3363 Standard Test Method for Film Hardness by Pencil Test.
 - 4. ASTM D 2794 Standard Test Method for Measuring Direct Impact.
 - 5. ASTM B 117 Standard Test Method for Corrosion Resistance.
 - 6. ASTM D 4585 Standard Test Method for Measuring Humidity Resistance.
 - 7. ASTM G 53 (UVA-340 bulbs, 4 hours light , 4 hours dark) Standard Test Method for Measuring QUV Resistance
 - 8. ASTM D 522 (Method A – Conical Mandrel) Standard Method for Measuring Flexibility
 - 9. MIL-PRF-85285D Section 4.6.13 Standard Test Method for Cleanability.
 - 10. ASTM D 4141, Method C (EMMAQUA) Standard Test Method for Exterior Exposure.
 - 11. ASTM D 6578 Standard Test Method for Graffiti Resistance.
 - 12. ASTM D 4587 Standard Test Method for QUV Exposure.

1.3 DEFINITIONS

- A. Terms PAINT or PAINTING shall in a general sense have reference to aromatic urethane organic zinc rich primer, aliphatic acrylic polyurethane intermediate coat, and aliphatic acrylic polyurethane finish coat, and the application of these materials.
- B. DRY FILM THICKNESS (DFT): Thickness, measured in mils, of a coat of paint in cured state

- C. Conform to ASTM D16 for interpretation of terms used in this section.

1.4 SUBMITTALS

A. Product Data:

1. Submit in accordance with Section 01300.
2. Submit manufacturer's literature describing products to be provided, giving manufacturer's name, product name, product line number, and ASTM Test Method results for each material.
3. Include technical data sheets for each coating, giving descriptive data, curing times, mixing, thinning, and application requirements.
 - a. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin and pigment.
 - b. Submit manufacturer's Material Safety Data Sheets (MSDS) and other safety requirements.

B. Samples:

1. Submit in accordance with Section 01300.
2. Selection Samples: Submit color charts displaying manufacturer's full range of standard colors for initial selection by Engineer.

C. Quality Assurance Submittals:

1. Certificates:
 - a. Submit in accordance with Section 01300.
 - b. Coatings manufacturer shall certify that coating materials utilized are "non-lead" (less than 0.06% lead by weight in dried film) as defined in Part 1303 of Consumer Product Safety Act.
 - c. Provide certification that specialized equipment as may be required by manufacturer for proper application of coating materials shall be utilized for work of this Section.
 - d. Provide manufacturer's certification that products to be used comply with specified requirements and are suitable for intended application.

D. Manufacturer's Instructions: Submit manufacturer's installation procedures in accordance with Section 01300, which shall be basis for accepting or rejecting actual installation procedures.

E. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacture of high performance coatings with a minimum of 10 years experience.
2. Applicator: Company trained in application techniques and procedures of coating materials with a minimum of 10 years experience on similar projects.

B. Single Source Responsibility:

1. Provide products of a single manufacturer or items standard with manufacturer of specified coating materials.

2. Provide secondary materials which are produced or are specifically recommended by coating system manufacturer to ensure compatibility of system.
- C. Regulatory Requirements: Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compound (VOC) ratings requirements for finishes at time of application.
- D. Pre-Installation Meeting:
 1. Schedule a pre-installation meeting to be attended by Contractor, Owner's representative, coating applicators, and a representative of coating material manufacturer to be held on-site before field application of coating systems begins.
 2. Topics to be discussed at meeting shall include:
 - a. Review of Contract Documents and accepted shop drawings with resolution of deviations or differences.
 - b. Review items such as environmental conditions, surface conditions, surface preparation, application procedures, and protection following application.
 - c. Establish on-site storage and working areas.
 - d. Identify application requirements and required preparation work.
 3. Prepare a written report of pre-installation conference and submit to parties in attendance within 3 days following conference.

1.6 MOCK-UP

- A. Before proceeding, prepare and provide a surface preparation and finish coating sample in a location as directed by the Architect/Owner. Sample shall determine surface preparation standards, application properties, and acceptable color and gloss appearances.
- B. When approved, use finishes as standard for application, appearance and materials for similar areas or items throughout project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 1. Deliver products in manufacturer's original unopened containers, each having manufacturer's label, intact and legible.
 2. Include on label for each container:
 - a. Manufacturer's name
 - b. Type of paint
 - c. Manufacturer's stock number
 - d. Color name and number
 - e. Instructions for thinning, where applicable
- B. Storage and Protection:
 1. Store materials in a protected area, away from construction activities and restricted to paint materials and related equipment.
 2. Maintain temperature in area of storage between 40 degrees F (4 degrees C) and 110 degrees F (43 degrees C).
 3. Comply with health and fire safety regulations.
 4. Remove damaged materials from Site.

1.8 PROJECT CONDITIONS

A. Environmental Requirements for Application of Coating Materials:

1. Air temperature: Not below 40 degrees F (2 degrees C) or above 110 degrees F (43 degrees C).
2. Minimum Surface Temperature:
 - a. Refer to specific product information sheets for minimum surface temperature requirements.
 - b. Minimum 5 degrees F (15 degrees C) above dew point and in a rising mode.
 - c. Relative humidity: no higher than 85%.
 - d. Wind Velocity: For exterior spray application, less than 15 mph (25 kph).
 - e. Atmosphere: Relatively free of airborne dust.

1.9 SEQUENCING

- A. Perform work in proper sequence with work of other trades to avoid damage to finished work.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Basis of Design: Tnemec Company, Inc. of Kansas City, Missouri. The paint products mentioned in the following specifications are set as standards of quality. Local Phone 708-387-0305. Local Contact Chris Wascher. Or approved equal.

2.2 COATING SYSTEM FOR STEEL (FLUOROPOLYMER)

A. Exterior Exposed Steel:

1. Surface Preparation: Prepare in accordance with SSPC SP-6 Commercial Blast Cleaning.

All surfaces shall be clean and free of all dust, dirt, grease, oil and foreign matter prior to painting.

2. Prime Coat: Apply one coat of Tnemec Series 90-97 Tnemec-Zinc at a dry film thickness of 2.5 to 3.5 mils.

After Prime Coat has cured, fill all voids, gouges, pits, bugholes and other surface anomalies with Tnemec Series 215 Surfacing Epoxy (WHERE DESIGNATED).

3. Intermediate Coat: Apply one Full Coat of Tnemec Series 73 Endura-Shield at a dry film thickness of 2.0 to 3.0 mils. Intermediate Coat Color to be determined by Tnemec Warranty Department.
4. Finish Coat: Tnemec Series 1071V Fluoronar (semi-gloss). Dry Film Thickness: 2.0 to 3.0 mils. (For high gloss use Series 1071V Fluoronar. For satin use Series 1072V Fluoronar).
5. Total Dry Film Thickness: 6.5 to 9.5 mils.

6. Finish Coat Color: X.

2.3 COATING SYSTEM FOR STEEL (POLYURETHANE)

A. Exterior Exposed Steel:

1. Surface Preparation: Prepare in accordance with SSPC SP-6 Commercial Blast Cleaning.

All surfaces shall be clean and free of all dust, dirt, grease, oil and foreign matter prior to painting.

3. Prime Coat: Apply one coat of Tnemec Series 90-97 Tnemec-Zinc at a dry film thickness of 2.5 to 3.5 mils.

After Prime Coat has cured, fill all voids, gouges, pits, bugholes and other surface anomalies with Tnemec Series 215 Surfacing Epoxy (WHERE DESIGNATED).

7. Intermediate Coat: Apply one Full Coat of Tnemec Series 73 Endura-Shield at a dry film thickness of 2.0 to 3.0 mils. Intermediate Coat Color to be determined by Tnemec Warranty Department.

8. Finish Coat: Tnemec Series 73 Endura-Shield (semi-gloss). Dry Film Thickness: 2.0 to 3.0 mils. (For high gloss use Series 1074 Endura-Shield. For eggshell use Series 1096 Endura-Shield).

9. Total Dry Film Thickness: 6.5 to 9.5 mils.

10. Finish Coat Color: X.

PART 3 EXECUTION

3.2 ACCEPTABLE INSTALLERS

- A. Applicator trained in application techniques and procedures of coating materials with a minimum of 10 years experience on similar projects.

3.3 EXAMINATION

- A. Examine areas and conditions under which application of coating systems is to be performed for conditions that will adversely affect execution, permanence, or quality of coating system application.
- B. Report conditions detrimental to timely and proper execution of Work to Architect.
- C. Do not proceed until unsatisfactory conditions have been corrected.
- D. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.4 PROTECTION

- A. Provide drop cloths, shields, and other protective equipment.
- B. Protect elements surrounding work of this section from damage or disfiguration.
- C. As Work proceeds, promptly remove spilled, splashed, or splattered materials from surfaces.
- D. Post Wet Paint signs during application of coating materials and until surfaces are adequately cured.
- E. Post No Smoking signs during application of solvent-based materials.
- F. Take precautionary measures to prevent fire hazards and spontaneous combustion.
- G. Remove empty containers from site.
- H. Place cotton waste, cloths and hazardous materials in containers, and remove from site daily.
- I. Protect work against damage until fully cured

3.5 SURFACE PREPARATION AND TOUCH-UP

- A. General Requirements:
 - 1. Prior to application of primer, prepare surfaces to receive specified coating system in compliance with manufacturer's recommendations and specifications of Steel Structures Painting Council as specified in this Section.
 - 2. Clean surfaces completely free of grease, scale, rust, oil, dirt, and other foreign matter/contamination, immediately prior to priming.
 - 3. Provide dry and smooth surfaces, free from dust and foreign matter which will adversely affect adhesion or appearance.
- B. Steel:
 - 1. Clean surfaces completely free of grease, rust, scale, dirt, dust, and oil.
 - 2. Surface Preparation:
 - a. Prepare in accordance with SSPC SP-6 Commercial Blast Cleaning.
 - b. All surfaces must be clean, dry, and free of contamination prior to the application of coatings.

3.6 REPAIR/RESTORATION

- A. At completion of Work, touchup and restore finishes where damaged.
- B. Defects in Finished Surfaces:
 - 1. When stain, dirt, or undercoats show through final coat, correct defects and cover with additional coats until coating is of uniform finish, color, appearance and coverage.

2. Touchup minor damage: where result is not visibly different from surrounding surfaces.
3. Where result is visibly different, either in color, sheen, or texture, recoat entire surface.

3.7 FIELD QUALITY CONTROL

- A. Testing Laboratory Services:
 1. Documents: Review Contract Documents and applicable sections of referenced standards.
 2. Field Painting Inspection:
 - a. Verify cleaning operations to surfaces are to condition specified.
 - b. Verify conformance of paint to specification.
 - c. Check for thickness of each coating, final thickness and holidays.
 - d. Check touchup for final finish.
 3. Reports:
 - a. Submit written progress reports describing tests and inspections made and showing action taken to correct non-conforming work.
 - b. Report uncorrected deviations from Contract Documents.
- B. Manufacturer's Field Service: Coatings manufacturer to provide technical assistance and guidance for application of coating system.

3.8 CLEANING

- A. At completion of day's work, remove from site rubbish and accumulated materials.
- B. Clean paint spots and other soiling from pre-finished surfaces and surfaces with integral finish using solvents which will not damage finished surface.
- C. Leave storage area clean and in same condition indicated for equivalent spaces in Project.

3.9 WASTE MANAGEMENT

- A. General Requirements:
 1. Place materials defined as hazardous or toxic waste in designated containers.
 2. Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal; pouring on ground not permitted.
 3. Place paints or solvents in designated containers for proper disposal.
 4. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- B. Containment/Disposal Requirements:
 1. Surface Preparation Debris Containment:
 - a. When required by federal, state or local regulation, entire structure shall be enclosed and surface preparation debris contained.
 2. Disposal of Surface Preparation Debris:
 - a. Surface preparation debris shall be disposed of in compliance with applicable federal, state and local regulations.
 3. Containment/Disposal Costs: Contractor shall be responsible for costs associated with containment and waste disposal that may result from execution of this Project.

END OF SECTION - 09 96 00.01

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Visual display board assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
- B. Sustainable Design Submittals:
 - 1. Product Data: For installation adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For visual display units.
 - 1. Include plans, elevations, sections, details, and attachment to other work.
 - 2. Show locations of panel joints.
 - 3. Include sections of typical trim members.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
- C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.8 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY (MB-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AJW Architectural Products.
 2. Claridge Products and Equipment, Inc.
 3. Peter Pepper Products, Inc.
- B. Visual Display Board Assembly: factory fabricated.
1. Assembly: markerboard.
 2. Corners: Square.
 3. Width: As indicated on Drawings.
 4. Height: As indicated on Drawings.
 5. Mounting Method: Direct to wall.
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
1. Color: White.
- D. Display Rail: Manufacturer's standard, extruded-aluminum display rail, end stops, designed to hold accessories
1. Size: Full length of visual display unit.
 2. Aluminum Color: Match finish of visual display frame and trim.
- E. Aluminum Frames: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.
1. Aluminum Finish: Clear anodic finish.

2.4 VISUAL DISPLAY BOARD ASSEMBLY (TB-1)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AJW Architectural Products.
 2. Claridge Products and Equipment, Inc.
 3. Peter Pepper Products, Inc.
- B. Visual Display Board Assembly: factory fabricated.

1. Assembly: Tackboard.
2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting Method: Direct to wall.

C. Tackboard Panel: Natural-cork tackboard panel on manufacturer's standard core.

1. Color and Pattern: As selected by Architect from full range of industry colors.

D. Aluminum Frames: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.

1. Aluminum Finish: Manufacturer's standard baked-enamel or powder-coat finish.

- a. Color: As selected by Architect from full range of industry colors and color densities.

2.5 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.

C. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

D. Hardboard: ANSI A135.4, tempered.

E. Particleboard: ANSI A208.1, Grade M-1.

F. Medium-Density Fiberboard: ANSI A208.2, Grade 130.

G. Fiberboard: ASTM C 208 cellulosic fiber insulating board.

H. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

1. Verify adhesives have a VOC content of 50 g/L or less.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level,

and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

- B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches (400 mm) o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cutout dimensional characters.
 - 2. Fabricated channel dimensional characters.

1.2 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: Half-size Sample of each type of dimensional character.
 - 2. Full-size Samples, if approved, will be returned to Contractor for use in the Project.
- E. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.
- F. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of dimensional character sign type(s) according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
 - 1. Uniform Wind Load: As indicated on Drawings.
 - 2. Other Design Load: As indicated on Drawings

- C. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.

- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 DIMENSIONAL CHARACTERS

- A. Cutout Characters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:

- 1. Character Material: Sheet or plate aluminum.
 - 2. Character Height: As indicated on Drawings.
 - 3. Thickness: As indicated on Drawings.
 - 4. Finishes:

- a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities

- 5. Mounting: As indicated on Drawings.

- B. Fabricated Channel Characters: Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners; and as follows.

- 1. Character Material: Sheet or plate aluminum.
 - 2. Material Thickness: Manufacturer's standard for size and design of character.
 - 3. Character Height: As indicated on Drawings.
 - 4. Character Depth: As indicated on Drawings.
 - 5. Finishes:

- a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

- 6. Mounting: Manufacturer's standard for size and design of character.

- a. Hold characters at manufacturer's recommended distance from wall surface.

- 7. Typeface: Helvetica

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.

- B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

- C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 3. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Adhesive: As recommended by sign manufacturer.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
 - 1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match sign-background color unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that electrical service is correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for

- displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
- b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
 3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 1423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.
2. Field-applied, vinyl signs.

B. Related Requirements:

C. Related Requirements:

1. Section 01 5000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary informational and directional signs.

1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Full-size Sample.
2. Room-Identification Signs: Full-size Sample.
3. Field-Applied, Vinyl Signs: Full-size Sample of characters on glass.

E. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 PANEL SIGNS

- A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters

having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied Graphics: Applied paint.
2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Radius.
3. Mounting: Manufacturer's standard method for substrates indicated with adhesive or two-face tape.
4. Text and Typeface: Accessible raised characters and Braille.

2.3 FIELD-APPLIED, VINYL SIGNS

- A. Field-Applied, Vinyl Sign, Type 2 Series Alternate: Prespaced characters die cut from 3- to 3.5-mil thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.
 1. Size: As indicated.
 2. Substrate: As indicated.
 3. Text and Font: As indicated.

2.4 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.6 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
- B. Adhesive: As recommended by sign manufacturer.
 - 1. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.7 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into indicated sign surface to produce precisely formed copy, incised to uniform depth.
 - 1. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
 - 1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot

be successfully repaired by finish touchup or similar minor repair procedures.

- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 102116 – SOLID SURFACE SHOWER AND DRESSING COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-surface shower surrounds.
 - 2. Shower receptors.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.
 - 2. Section 102800 "Toilet, Bath, and Laundry Accessories" for grab bars, robe hooks, shower curtain rods, and similar accessories.
 - 3. Section 224000 " Plumbing Fixtures" for shower heads, valves, and controls.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For shower and dressing compartments.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted accessories.
 - 3. Show locations of centerlines of drains.
- C. Samples for Initial Selection: For each type of compartment material indicated.
 - 1. Include Samples of hardware and accessories for material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for compartments, prepared on 6-inch-square Samples of same thickness and material indicated for the Work.
 - 2. Each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of shower and dressing compartment.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For shower and dressing compartments to include in maintenance manuals.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of fixtures, drains, walls, columns, ceilings, and other construction contiguous with shower and dressing compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84: Flame spread meets Class A, Smoke Developed Index 85; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for shower and dressing compartments designated as accessible.

2.2 SOLID-SURFACE SHOWER SURROUND

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Swanstone Square Tile Shower Walls, or equivalent product by one of the following:
 - a. Avonite Surfaces.
 - b. E. I. du Pont de Nemours and Company.
 - c. Formica Corporation.
 - d. LG Chemical, Ltd.
 - e. Meganite Inc.
 - f. Samsung Chemical USA, Inc.
 - g. Transolid, Inc.
 - h. Wilsonart International.
- B. Configuration: Multiple-piece surround at showers.
- C. Material: Reinforced Solid Surfacing (Homogeneous compression molded material composed of acrylic resins or polyester/acrylic resin blend, fire-retardant filler materials, fiber reinforcement, and coloring agents.)

- D. Thickness: Minimum 0.225 inches.
- E. Size: Full Height, Length x Depth indicated on Drawings, verify actual size by field measurement.
- F. Color: To be selected from Manufacturers' full line of colors.
- G. Accessories:
 - 1. Soap dish.
 - 2. Recessed shelf.
- H. Reinforcement for Grab Bars and Wall-Mounted Accessories: Factory-installed steel mounting plates anchored to plywood to meet load resistance indicated in ASTM F448.

2.3 ROLL-IN SHOWER RECEPTOR

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Swanstone Barrier-Free Shower Floors with Trough Drain, or equivalent product by one of the following:
 - a. Avonite Surfaces.
 - b. E. I. du Pont de Nemours and Company.
 - c. Formica Corporation.
 - d. LG Chemical, Ltd.
 - e. Meganite Inc.
 - f. Samsung Chemical USA, Inc.
 - g. Transolid, Inc.
 - h. Wilsonart International.
- B. Configuration: Compression molded floor with trough drain.
- C. Material: Reinforced Solid Surfacing (Homogeneous compression molded material composed of acrylic resins or polyester/acrylic resin blend, fire-retardant filler materials, fiber reinforcement, and coloring agents.)
- D. Size: Length x Depth indicated on Drawings, verify actual size by field measurement.
 - 1. Drain Strainer: Manufacturer's standard, removable.
 - 2. Drain Gasket: Manufacturer's standard gasket sized to fit waste pipe.
- E. Finish: Manufacturer's standard finish on exposed surfaces, as selected by Architect from manufacturer's full range.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.

- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install compartments rigid, straight, level, and plumb. Secure compartments in position with manufacturer's recommended anchoring devices.
- B. Shower Receptors: Install prefabricated shower receptors with drain gasket compression fit to OD of waste pipe.

END OF SECTION 102116

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Corner guards.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
- B. Sustainable Design Submittals:
 - 1. Chain-of-Custody Qualification Data: For manufacturer and vendor.
 - 2. Product Data: For adhesives, indicating VOC content.
 - 3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For each type of wall and door protection showing locations and extent.
 - 1. Include plans, elevations, sections, and attachment details.
- D. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Corner Guards: 12 inches (300 mm) long. Include example top caps.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Corner-Guard Covers: Full-size metal covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 48-inch- (1200-mm-) long units.
 - 2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall- and door-protection products from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Babcock-Davis.
 - b. Hiawatha, Inc; a division of the Activar Construction Products Group.
 - c. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
 - d. inpro Corporation.
 2. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0625 inch (1.6 mm).
 - b. Finish: Directional satin, No. 4.
 3. Wing Size: Nominal 2-1/2 by 2-1/2 inches (65 by 65 mm).
 4. Corner Radius: 1/8 inch (3 mm).
 5. Mounting: Adhesive.

2.4 MATERIALS

- A. Adhesive: As recommended by protection product manufacturer.
1. Verify adhesives have a VOC content of 70 g/L or less.
 2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.6 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

3.4 CLEANING

- A. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Warm-air dryers.
 - 4. Underlavatory guards.
 - 5. Custodial accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Toilet Tissue (Roll) Dispenser:
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation; "Model No. 5A10-11" or a comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
 2. Description: Double-roll dispenser.
 3. Mounting: Surface mounted.
 4. Operation: Single roll dispenser with drop-down roll in reserve; rolls mounted on non-removable molded polyethylene spindles with bottom-hinged service door with keyed tumbler lock.
 5. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue rolls.

6. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Paper Towel (Roll) Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Tork; “Model No. 86ECO”.
2. Description: Battery operated electronic touch-free auto transfer permitting controlled delivery of paper rolls in preset lengths.
3. Mounting: Surface mounted.
4. Material and Finish: ABS plastic, gray.
5. Lockset: Tumbler type.

D. Automatic Liquid-Soap Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation; “Model No. 6A00-11” or a comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing soap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted..
4. Capacity: 27 oz. (800 mL).
5. Materials: Heavy gauge stainless steel body with exposed surfaces in satin finish with re-usable, cap sealed plastic tank reservoir.
6. Refill Indicator: Sight gauge.
7. Low Battery Indicator: LED indicator.

E. Grab Bar:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corp. “Model No. 812 Series” or comparable product by one of the following:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment Inc.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Safety-grip finish.
4. Outside Diameter: 1-1/2 inches (38 mm).
5. Configuration and Length: As indicated on Drawings.

F. Vendor:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation; “Model No. 4A20-11” or a comparable product by one of the following:

- a. ASI Group.
- b. Bobrick Washroom Equipment, Inc.
2. Type: Sanitary napkin and tampon.
3. Mounting: Surface mounted.
4. Capacity: 18 napkins and 28 tampons.
5. Operation: Two coin (50 cents).
6. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
7. Lockset: Tumbler type with separate lock and key for coin box.

G. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation; "Model No. 4A10-11" or a comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Mirror Unit:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corp "Model No. 781 Series" or comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
2. Frame: Stainless-steel channel.
 - a. Corners: Mitered and mechanically interlocked.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
4. Size: 24" x 42".

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.
- B. Shower Curtain Rod:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corp “Model No. 9538 Series” or comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
2. Description: 1-inch (25.4-mm) OD; fabricated from nominal 0.0375-inch- (0.95-mm-) thick stainless steel.
3. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
4. Finish: Stainless steel, No. 4 finish (satin).

C. Robe Hook:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corp “Model No. 9144” or comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
2. Description: Single-prong unit.
3. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 WARM-AIR DRYERS

A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer.

B. High-Speed Warm-Air Dryer:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Excel Dryer Inc.; Xlerator Hand Dryer.
2. Description: High-speed, warm-air hand dryer for rapid hand drying.
3. Mounting: Surface mounted.
4. Operation: Electronic-sensor activated.
5. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
6. Electrical Requirements: 115 V, 13 A, 1500 W.

2.5 CHILDCARE ACCESSORIES

A. Diaper-Changing Station:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corp “Model No. 962-11” or comparable product by one of the following:
 - a. ASI Group.
 - b. Bobrick Washroom Equipment, Inc.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.

- a. Engineered to support minimum of 250-lb (113-kg) static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches (100 mm) from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with HDPE interior in manufacturer's standard color.
6. Liner Dispenser: Built in.

2.6 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Truebro, Inc. "Lav Guard Undersink Protective Pipe Cover System
 - b. Brocar Products, Inc. "Trap Wrap"
 - c. Plumberex Specialty Products "Handy Shield Safety Covers
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.7 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Mop and Broom Holder:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
2. Description: Unit with shelf, hooks, and holders.
3. Length: 36 inches (914 mm).
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.

2.8 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.9 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

SECTION 10 4413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:
 - a. Portable fire extinguisher.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

A. 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.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.3 FIRE-PROTECTION CABINET (FE1)

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Activar Construction Products Group, Inc. - JL Industries, Academy Series Aluminum Fire Extinguisher Cabinets (Model 2025) or comparable product by one of the following:
 - a. Larsens Manufacturing Company.
 - b. Potter Roemer LLC; a Division of Morris Group International.
- B. Cabinet Construction: Nonrated, unless otherwise indicated; rating to match that of wall construction where installed in fire rated walls.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Aluminum sheet.
- D. Recessed Cabinet:
 - 1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- E. Cabinet Trim Material: Aluminum sheet.
- F. Door Material: Aluminum sheet.
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- J. 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. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Silk-screened or Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

K. Materials:

1. Aluminum: ASTM B221 for extruded shapes and aluminum sheet, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet.
 - a. Finish: To be selected by Architect.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction and as directed by Architect.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets 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 and mounting bracket manufacturers.
- 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 10 4413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers.
- B. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
 - b. Larsen's Manufacturing Company.
 - c. Potter Roemer LLC; a Division of Morris Group International.
 - 2. Valves, Handles and Levers: All metal, no plastic components.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

City of Evanston
Evanston Animal Shelter
Holabird & Root, LLC Project No. 16015

Issue for Bid / Permit
12/08/2022

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Knocked-down corridor lockers.
 - 2. Exterior parcel lockers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than two units:
 - a. Identification plates.
 - b. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in ICC A117.1 and 2018 Illinois Accessibility Code.

2.3 KNOCKED-DOWN CORRIDOR LOCKERS

- A. Manufacturers: Subject to compliance with requirements, products by one of the following:
1. ASI Storage Solutions.
 2. Global Industrial.
 3. Lyon
 4. Penco.
- B. Doors: One piece; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Doors for box lockers less than 15 inches (381 mm) wide may be fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
 2. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
 3. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet; welded to inner face of doors.
 4. Door Style: Vented panel as follows:
 - a. Louvered Vents: No fewer than three louver openings at top and bottom for double-tier lockers.
- C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch (0.61-mm) nominal thickness, with single bend at sides.
 2. Backs and Sides: 0.024-inch (0.61-mm) nominal thickness, with full-height, double-flanged connections.
 3. Shelves: 0.024-inch (0.61-mm) nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into

vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
 2. Frame Vents: Fabricate face frames with vents.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- F. Locks: Digital keypad locks.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
- H. Hooks: Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.
- I. Continuous Zee Base: Fabricated from manufacturer's standard thickness, but not less than 0.060-inch (1.52-mm) nominal-thickness steel sheet.
1. Height: 4 inches (102 mm).
- J. Recess Trim: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- K. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch (0.91-mm) nominal-thickness steel sheet.
- L. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.
- M. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet.
- N. Center Dividers: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet.
- O. Materials:
1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- P. Finish: Baked enamel or powder coat.
1. Color: As selected by Architect from manufacturer's full range.
- 2.4 EXTERIOR PARCEL LOCKERS
- A. Basis-of-Design Product: Subject to compliance with requirements, provide Quadient, "Parcel Pending Standard Outdoor Locker System" or comparable product.
- B. Doors: One piece; fabricated from 18-gauge double reinforced cold-rolled steel construction.

1. Door Style: Unperforated panel.
 2. Size and Configuration: As indicated on Drawings.
- C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. 18-gauge double reinforced.
 2. Rain, salt, and wind (category 3) resistant.
- D. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.
- E. Locks: Digital keypad locks.
- F. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
- G. Continuous Sloping Tops: Manufacturer's standard awning.
- H. Materials:
1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 (ZF180) zinc-iron, alloy (galvannealed) coating designation.
- I. Finish: Baked enamel or powder coat.
1. Color: As selected by Architect from manufacturer's full range.

2.5 LOCKS

- A. Digital Keypad Locks: Battery-powered electronic keypad with reprogrammable manager and owner codes that override access. Three consecutive incorrect code entries shall disable lock for three minutes.
1. Designed for shared or temporary access by multiple users, with user-defined code to lock and unlock. Provide LED indicator to show when lock is in use.

2.6 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.

2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
- D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for preassembly at plant prior to shipping.
- E. Accessible Lockers: Fabricate as follows:
 1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
- G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

2.7 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 1. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
- B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105613 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Case-type metal storage shelving.
 - 2. Four-post metal storage shelving.
 - 3. Post-and-beam metal storage shelving.

1.3 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: For metal storage shelving.

1. Include plans, elevations, sections, and attachment details.
 2. Include installation details of connectors, lateral bracing, and special bracing.
- D. Samples for Initial Selection: For each type of metal storage shelving with factory-applied color finishes.
1. Include Samples of accessories involving color selection.
- E. Product Schedule: For metal storage shelving. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For metal storage shelving, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of metal storage shelving.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Shelf-to-Post Connectors: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 connectors.
 2. Shelf-Label Holders: Full-size units equal to 5 percent of amount installed for each type indicated, but no fewer than 10 holders.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sustainable Design Performance:

1. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 FOUR-POST METAL STORAGE SHELVING

A. Open Four-Post Metal Storage Shelving: Complying with MH 28.1 and field assembled from factory-formed components. Shelves span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Lyon LLC; “2000 Series Shelving – Open Unit” or a comparable product by one of the following:
 - a. Penco Products, Inc.
 - b. Spacesaver Corporation.
2. Load-Carrying Capacity per Shelf: 550 lb.
3. Posts: Fabricated from hot-rolled steel; in beaded shape; with perforations at 1-1/2 inches (38 mm) o.c. to receive shelf-to-post connectors.
 - a. Unit Configuration: Configure shelving units as starter- and add-on unit assemblies.
 - 1) Add-On Shelf Posts: Fabricated from hot-rolled steel, manufacturer's standard shape; perforated to match main posts.
 - b. Post Base: Manufacturer’s standard.
4. Bracing: Manufacturer's standard, single or double diagonal cross bracing.
 - a. Location: At unit back and ends as required for stability, load-carrying capacity of shelves, and number of shelves indicated.
5. Solid-Type Shelves:
 - a. Steel Sheet: Nominal thickness as required for load-carrying capacity per shelf.
 - b. Slots or Holes for Shelf Dividers: 2 inches (51 mm) o.c.
 - c. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
6. Shelf Quantity: As indicated on drawings.
7. Shelf-to-Post Connectors: Compression clips.
8. Base: Open, with exposed post legs.
9. Overall Unit Width: As indicated on drawings.

10. Overall Unit Depth: As indicated on drawings.
11. Overall Unit Height: As indicated on drawings.
12. Accessories:
 - a. Shelf-Label Holders: Clear plastic, designed to clip onto front edge of shelf.
13. Steel Finish: Baked enamel or powder coat.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 ANCHORS

- A. Floor Anchors: Galvanized-steel, post-installed expansion anchors power-actuated fasteners or threaded concrete screws. Provide number per unit recommended by manufacturer.
- B. Wall Anchors: Manufacturer's standard, galvanized-steel anchors designed to secure metal storage shelving to adjacent wall. Provide one per shelving unit for each shelving unit adjacent to a wall unless additional anchors are indicated in calculations.

2.4 FABRICATION

- A. Fabricate metal storage shelving components to provide field-assembled units that are square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.
 1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 2. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 3. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- B. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- C. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.
- D. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so surface is smooth after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
 - 5. Install seismic restraints.
 - 6. Connect side-to-side and back-to-back shelving units together.
 - 7. Install shelves in each shelving unit at spacing indicated on Drawings.
 - a. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
- B. Accessories:
 - 1. Shelf-Label Holders: Install one on each shelf.
 - a. Install centered within each shelving unit.

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch (13 mm) in up to 10 feet (3 m) of height, not exceeding 1 inch (25 mm) for heights taller than 10 feet (3 m).

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

SECTION 10 8213 – ROOF SCREENS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Stand-alone roof equipment screens and supporting steel framework. Screens shall be designed to attach to the roof structure and not the equipment being screened.
- B. Roof screen accessories.

1.2 RELATED SECTIONS

- A. Section 051200 - Structural Steel: Metal Framing.
- B. Section 053113 - Steel Roof Deck.
- C. Section 055000 - Metal Fabrications: Frames and supports.
- D. Section 074213 – Formed Metal Wall Panels
- E. Section 077213 - Roof Curbs.
- F. Section 099100 - Paints and Coatings: Field applied paint finish.
- G. Division 23 - Roof Top HVAC Equipment.

1.3 REFERENCES

- A. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM A 1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- E. ASTM B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
- F. ASTM D 4811 - Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing.
- G. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.
- H. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- J. AWS D1.1 - Structural Welding Code - Steel.
- K. AWS D1.6 - Structural Welding Code - Stainless Steel.

1.4 COORDINATION

- A. Coordinate Work with other operations and installation of roofing materials to avoid damage to installed insulation and membrane materials.

1.5 ACTION SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Layout and erection drawings showing typical cross sections and dimensioned locations of all frames and base supports. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, shape, and patterns.

1.6 INFORMATIONAL SUBMITTALS

- A. Design Calculations: 3 copies of structural design calculations for structural components and components resisting wind loads with seal and signature of professional engineer licensed in the State of Illinois.
- B. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.
- D. Warranties: 3 signed copies.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with a minimum five years documented experience in producing pre-manufactured metal-framed equipment screens.
- B. Design Qualifications: Provide structural design calculations stamped by a professional engineer licensed in the state in which this project is located.
- C. Welders: AWS certified within previous 12 months.

- D. Pre-Installation Meeting:
 - 1. Convene at job site, at least seven calendar days prior to scheduled beginning of construction activities of this section, to review requirements of this section.
 - 2. Require attendance by representatives of the installing subcontractor (who will represent the system manufacturer), the mechanical subcontractors and other entities affected by construction activities of this section.
 - 3. Notify Architect four calendar days in advance of scheduled meeting date.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the project site clearly marked for proper identification.
- B. Receive, handle and store materials in conformance with the manufacturers printed instructions.
- C. Store products under cover, in manufacturer's unopened packaging until ready for installation.
- D. Protect materials from exposure to moisture.
- E. Store materials in a dry, warm, ventilated weathertight location.
- F. Protect metal fabrications from damage by exposure to weather.
- G. Handling: Use a forklift or crane to move material. Do not lift the bundles by the metal bands.
 - 1. Fork Lift: Spread the forks as far as possible to balance the load. Drive slowly when moving long bundles over uneven surfaces to avoid tipping the load
 - 2. Crane: Position the canvas sling straps so that the space between the straps is at least 1/3 the length of the bundle. Use sling straps with looped ends running one end of the strap through the loop at the other end to cinch the bundle when lifted. When setting the load on the roof, put wood blocks under it to protect the roof and allow space to remove the sling straps.
 - 3. Roof Placement: Spread the bundles and crates out as much as possible to avoid overloading the roof structure. Place the material directly over major supports such as beams or trusses.
 - 4. Position bundles of tubing parallel to the slope of the roof and block prior to opening to prevent the tubing from rolling down the roof slope when unbundled.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Verify roof screen dimensions and conditions of the installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating equipment enclosure without field measurements. Coordinate construction to ensure that

actual dimensions correspond to established dimensions.

1.10 WARRANTY

- A. Framing System: Provide manufacturer's standard written limited warranty stating that the complete framing system shall be warranted against structural failure due to cracking, buckling, bending, tearing or corrosion arising under normal use and environmental conditions for the coverage period applicable.
 - 1. Products installed on projects located 2 miles or greater from salt or brackish bodies of water shall be warranted for twenty (20) years
 - 2. Products installed on projects located greater than 1 mile but less than 2 miles from salt or brackish bodies of water will be warranted for five (5) years, except for aluminum, stainless steel or copper Products which will be warranted for twenty (20) years.
 - 3. Products installed on projects located 1 mile or less from salt or brackish bodies of water will be warranted for three (3) years, except for aluminum, stainless steel or copper Products which will be warranted for twenty (20) years
- B. Panel Finish:
 - 1. Provide written warranty stating that the paint finish applied on all equipment enclosure panels will be warranted against chipping, peeling, cracking, fading, or blistering for the coverage period of twenty (20) years.
 - 2. Provide warranty signed by the panel manufacturer and paint finish applicator (if separate from manufacturer).
- C. Wall Panels: Refer to Section 07 4213, Formed Metal Wall Panels
- D. The above warranties are in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Design Loads: Comply with Building Code for site location and building height.
 - 1. Design to resist ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
 - 2. Design all materials, assembly and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.
- B. Structural Design: Prepare structural design calculations for screen framing and attachment to structure including reactions at base supports for verification of roof structure by Architect.
- C. All welds to be performed by an AWS certified welder. Valid certification to be provided.

2.2 MANUFACTURERS

- A. Acceptable Manufacturer, Basis of Design: RoofScreen Mfg., which is located at: 347 Coral St. ; Santa Cruz, CA 95060; Toll Free Tel: 866-766-3727; Tel: 831-421-9230; Fax: 866-253-0738; Email: request info (info@roofscreen.com); Web: www.roofscreen.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section [012500, Substitutions Procedures][016000, Product Requirements and Substitutions].

2.3 MATERIALS

- A. Square Base Supports: Weldments fabricated from cold rolled steel conforming to ASTM A 1008, fabricated with pre-punched holes in base plate for fastening to roof structure. After fabrication, apply minimum 2 to 4 mil baked on powder coat primer.
 - 1. Height 5 inches (127 mm).
 - 2. Height 9 inches (229 mm).
 - 3. Height 12 inches (305 mm).
- B. Square Base Support Extensions: Fabricated from same material and finish as base supports.
 - 1. Height 3 inches (76 mm).
 - 2. Height 4 inches (101 mm).
- C. Square Base Cap: Weldments fabricated from AISI Type 304 stainless steel with mill finish, and fabricated to overlap base support and flashing boot a minimum of 2 inches (51 mm). Provide moment resisting adjustable connection to attach framing to base cap.
- D. Round Post Supports: 12 inch (305 mm) tall weldments fabricated from galvanized steel tube conforming to ASTM A 500 and cold rolled steel plate conforming to ASTM A36, fabricated with pre-punched holes in base plate for fastening to roof structure. After fabrication, apply minimum 2 to 4 mil shop primer to base plate and weld. Provide height adjustment with galvanized tube sleeve conforming to ASTM A 500, sized to telescope over outside of round post tube and fastened at desired height with self-drilling, self-tapping screws.
- E. Round Post Cap: Weldments fabricated from AISI Type 304 stainless steel with mill finish fabricated to slip over 2-1/2" sleeve tube allowing adjustable height when used with Round Post Support.
- F. Square TPO Roof Flashing: Fabricated from 60 mil, white, single ply TPO sheet conforming to ASTM D 6878. Provide with base flange that extends a minimum of 5 inches (127 mm) onto the roof surface on all four sides. Riser shall be tapered to allow easy fit over Square Base Supports with minimal gap at top of flashing. Hot weld all seams for water tightness.
- G. Round TPO Roof Flashing: Fabricated from 60 mil, white, single ply TPO sheet conforming to ASTM D 6878. Provide with base flange that extends a minimum of 5 inches (127 mm) onto the roof surface on all four sides. Hot weld all seams for water tightness.
- H. Roof Flashing: Refer to Division 07 section that specifies the roof membrane.

- I. Base Cap Gasket: EPDM with self-adhesive closed cell foam.
- J. Framing: Carbon steel structural tubing in manufacturer's standard sizes, conforming to ASTM A 500 with manufacturer's standard galvanized coating conforming to ASTM B 117 salt spray testing. Provide with wall thickness as determined by structural calculations.
- K. Connector Fittings: Fabricated from AISI Type 304 stainless steel with mill finish.
- L. Steel Z section: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating.
- M. Steel Hat Channel: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating.
- N. Hardware: Bolts, nuts, washers and screws 18-8 stainless steel.
- O. Welding Materials: AWS D1.1; type required for materials being welded.
- P. Panel: Refer to Section 07 4213, Formed Metal Wall Panels
 - 1. Profile:
 - a. 3 inch Deep Rib Panel.
 - 2. Base Metal:
 - a. Minimum 26 gauge Galvalume steel sheet, AZ50, conforming to ASTM A 792 for painted and unpainted panels.
 - 3. Finish:
 - a. PVDF fluoropolymer, 1 mil, 2 coat, 70 percent.
 - b. Color as selected by Architect from manufacturer's standard color range, 20 colors minimum.
 - c. Coat reverse side with off-white primer coat.
 - 4. Panel Fasteners: No. 14 self-tapping sheet metal screw. Color coat heads to match panel color.
 - 5. Panel Trim: Same material and finish as panel. Configuration as shown on Drawings

2.4 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Fabricate system components so that portions of screen can be dismantled for repairs to equipment being screened and for future roof replacement.
- F. Trim and Closures: Fabricated from 24 gauge metal and finished with the manufacturer's

standard coating system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine area where work will be installed to verify the installation can be performed in accordance with the Drawings and structural calculation requirements without interference from other equipment or trades.
- B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Do not begin installation until conditions have been properly prepared.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.
- D. Anchor fabrications to structure as indicated.
- E. Separate dissimilar metals and use gasketed fasteners, isolation shim, or isolation tape to eliminate possibility of corrosive or electrolytic action between metals.
- F. Exercise care when installing components so as not to damage finish surfaces. Touch up as required to repair damaged finishes.
- G. Install flashing boots at base supports as required to provide a watertight connection. Install as recommended by the roof membrane manufacturer.
- H. Remove all protective masking from material immediately after installation.

3.4 CLEANING AND PROTECTION

- A. Remove all protective masking from framing and trim material immediately after installation. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. Maintain in a clean condition during construction.
- B. Protect installed products until completion of project.

1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
 2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.
- C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
- D. Replace metal wall panels and framing members that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 108213

SECTION 11 70 00 – MEDICAL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Medical Equipment.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for blocking to support wall- and ceiling-mounted equipment.
2. Section 09 29 00 "Gypsum Board" for gypsum board backing at walls and ceiling.
3. Section 09 51 23 "Acoustical Tile Ceilings" for ceiling tile backing.
4. Section 26 01 00 "Electrical General Requirements" for electrical power to equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Submit catalog cuts to the Owner for approval of the type, model, and finish of equipment and appliances.

1.3 QUALITY ASSURANCE:

- A. Furnish items in proper operating condition and without any defects or damage to finishes.
- B. Check and make necessary adjustments to insure that installed items operate faultlessly.

1.4 WARRANTY

- A. Turn over to the Owner guaranty or warranty certificates for the furnished equipment and appliances.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S

A. Per Schedule in Drawings.

1. Covetrus, northamerica.covetrus.com (885) 742-3461
2. Grainger American Biotech Supply, 2356 S. Ashland Ave., Chicago, IL 60608 (773)475-0251
3. Med-Vet, customerservice@shopmedvet.com, 13822 W. Boulton Blvd., Mettawa, IL 60045 (800) 544-7521
4. Midmark, animalhealth@midmark.com, 1001 Asbury Dr., Buffalo Grove, IL 60089 (847) 415 9800
5. Suburban Surgical Co. Inc., sales@ssciusa.com 275 12th Street, Wheeling, IL 60090, (847) 777-9800
6. VetLine, cs@petprosupplyco.com, 5729 Lebanon Road, Suite 144, Frisco, TX 75034 (855) 738-7761

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames, blocking and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine equipment before installation. Reject equipment that is wet, moisture damaged, mechanically damaged and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. In accordance with layout shown on Drawings and in strict conformity with the manufacturer's recommendations.
- B. Furnish necessary blocking, filler pieces, angles, moldings, and other finish items for complete installation and faultless operation of the equipment.

END OF SECTION 11 70 00

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, the Construction Contract, including all Exhibits and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Manually operated roller shades with single rollers.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

- C. Samples for Verification: For each type of roller shade.

- 1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.

- D. Qualification Data: For Installer.

- E. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

- F. Maintenance Data: For roller shades to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

- B. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect and Owner of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, for Window Shades provide one of the following Manufacturers' product.
 - 1. Draper Inc.
 - 2. MechoShade Systems.
 - 3. Nysan.
 - 4. Or Equal
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: Right side of inside face of shade.
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material .
- E. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open.
 - 2. Endcap Covers: To cover exposed endcaps.
 - 3. Installation Accessories Color and Finish: As selected from Manufacturer's full range.

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.
 - 1. Source: Roller shade manufacturer.
 - 2. Type: PVC-coated fiberglass with bonded PVC film.
 - 3. Orientation on Shadeband: Up the bolt.
 - 4. Features: Washable.
 - 5. Color: As selected by Architect from manufacturer's full range.

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
- B. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect and Owner, before time of Substantial Completion.

END OF SECTION

SECTION 123570 - HEALTHCARE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes modular metal healthcare casework for the following rooms
 1. Medical Suite, Room 11
 2. Dog isolation, Room 15
 3. Food Prep, Room 17
 4. Corridor, Room C5
 5. Laundry, Room 19
 6. Dog Intake, Room 22
 7. Cat Intake, Room 25
 8. Cat Isolation, Room 28
- B. Related Requirements:
 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring healthcare casework.
 2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring healthcare casework.
 3. Section 123616 "Metal Countertops" for stainless-steel countertops, sinks, and shelves.
 4. Section 123661 "Solid Surfacing Countertops" for solid surface countertops.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of healthcare casework.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.

1. Indicate locations of blocking and reinforcements required for installing healthcare casework.
 2. Indicate hardware locations.
 3. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
 4. Include coordinated dimensions for equipment specified in other Sections.
- C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed hardware indicated, in full-size units.
- F. Sustainable Design Submittals:
1. Recycled content of metal, wood, and plastics
 2. LEED IEQ 4 compliant composite wood
- G. Installer Reports: Submit copy of installer's reports for the following:
1. Certification that installer is acceptable to the manufacturer.
 2. Manufacturer's field service report.
 3. Pre-installation meeting report.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of healthcare casework provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged casework finish.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Basis of Design Manufacturer:
1. Midmark Corporation
 - a. Synthesis Casework Collection.
 2. Acceptable Manufacturers
 - a. Kewaukee Scientific
 - b. Mott Manufacturing

- B. Source Limitations: Obtain healthcare casework from single source from single manufacturer.
- C. Product Designations: Drawings indicate sizes and configurations of healthcare casework by referencing designated manufacturer's catalog numbers. Other manufacturers' metal healthcare casework of similar sizes, of similar door and drawer configurations, and complying with the Specifications may be considered. See Section 016000 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. Provide healthcare casework which has been manufactured, fabricated, and installed to withstand the medical environment and maintain manufacturer's warranted performance without defects, damage, or failure.

2.3 MODULAR METAL CASEWORK

- A. Modular Metal Casework Basis of Design; Synthesis™ Casework Collection by Midmark
 1. Sizes and Configuration: As indicated on Drawings.
 2. Metal Finish: Premium powdercoat, baked-on epoxy
 3. Metal Finish: 7 mil high-performance finish applied to powdercoated steel frame
 4. Colors and Styles: As selected from manufacturer's standard options
- B. Casework Assembly:
 1. Design: Individual, interchangeable, integral, modular units.
 2. Cabinet: 18 gauge cold rolled steel; multi-piece shell and frame design; riveted and press joined (Tog-L-Loc).
 3. Filler and Trim: Manufacturer's standard coordinated components.
- C. Door Construction:
 1. Panel Style: Flush Overlay.
 2. Front/Back: 12 mil seamless polymer-covered front; melamine back.
 3. Reveal: 1 mm reveal from the edge of the frame.
 4. Core: 45 lb. LEED IEQ compliant MDF board, 3/4 inch thick. Composite wood material to meet CARB P2 emission std of CARB regulation 91320.2.
- D. Drawers:
 1. Deep Drawer Construction: One piece molded polystyrene drawer bodies with rounded corners.
 2. File Drawer Construction: 18 gauge cold rolled steel frame; including suspended file system and file bars.
 3. Front/Back: 12 mil seamless polymer-covered front; melamine back.
 4. Reveal: 1 mm reveal from the edge of the frame.
 5. Core: 45 lb. LEED IEQ compliant MDF board, 3/4 inch thick. Composite wood material to meet CARB P2 emission std of CARB regulation 91320.2.
- E. Adjustable Shelving: 18 gauge cold rolled steel, painted to match cabinet color; manufacturer's standard die cast zinc support clips.
 1. Countertops, See Sections:

- a. 123616 "Metal Countertops" for stainless-steel countertops, sinks, and shelves.
 - b. 123661 "Solid Surfacing Countertops" for solid surface countertops.
- F. Filler Panel/Leg Supports: LEED IEQ compliant MDF core. Composite wood material to meet CARB P2 emission std of CARB regulation 91320.2.
- G. Sustainable Design, Environmental Impact Summary:
1. Wood Content Average of 22% MDF components, 100% recycled or recovered fiber and EPP certified by the Composite Panel Association.
 2. Steel Content: Average of 77% steel components, with steel industry standard 25% post consumer recycled content, 100% recyclable.
 3. MDF: LEED IEQ 4.4 Compliant MDF as the substrate for door and drawer fronts. Wood components CARB Phase II compliant.
 4. Countertops: LEED IEQ 4.4 compliant for postform laminate and for solid surface countertops. Wood components CARB Phase II compliant.
 5. Plastic Components: Labeled with ASTM recycling code.
 6. Packaging: Blanket wrap can be taken back and reused for additional deliveries, and corrugated cardboard packaging with 15% recycled content.

2.4 CASEWORK MATERIALS

- A. Steel Sheet: Cold-rolled commercial steel sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.
- B. Nominal Steel Thicknesses for Enameled-Steel Healthcare Casework:
1. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: 0.048 inch (1.21 mm). Bottoms may be 0.036 inch (0.91 mm) if reinforced.
 2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.036 inch (0.91 mm) except 0.048 inch (1.21 mm) for unreinforced shelves more than 36 inches (900 mm) long.
 3. Intermediate Horizontal Rails, Center Posts, and Top Gussets: 0.060 inch (1.52 mm).
 4. Drawer Runners and Hinge Reinforcements: 0.075 inch (1.90 mm).
 5. Leveling and Corner Gussets: 0.105 inch (2.66 mm).
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, stretcher-leveled standard of flatness.
- D. Nominal Stainless-Steel Thicknesses for Stainless-Steel Healthcare Casework:
1. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: 0.050 inch (1.27). Bottoms may be 0.038 inch (0.95 mm) if reinforced.
 2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.038 inch (0.95 mm) except 0.050 inch (1.27 mm) for unreinforced shelves more than 36 inches (900 mm) long.
 3. Intermediate Horizontal Rails, Center Posts, Tubular Legs, and Top Gussets: 0.062 inch (1.59 mm).
 4. Drawer Runners and Hinge Reinforcements: 0.078 inch (1.98 mm).
 5. Leveling and Corner Gussets: 0.109 inch (2.78 mm).

- E. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.

2.5 CABINET FABRICATION

- A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Integrally frame and weld to form a dirt- and vermin-resistant enclosure. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).
- B. Toe Space: Unless casework is built-in, provide metal toe space, fully enclosed, 4 inches (100 mm) high by 3 inches (75 mm) deep, with no open gaps or pockets.
- C. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets and with hemmed or flanged edges.
- D. Trim Flanges: Trim fabricated from same material and with same finish as cabinets. Provide at perimeter of recessed cabinets.

2.6 SPECIALTY CABINETS

- A. Narcotics Cabinets: Construct of stainless steel as individual, freestanding units with finished sides and top and double-walled bottom. Provide with double-pan flush outer door and 0.062-inch- (1.59-mm-) nominal thickness, single-pan inner door, both with locks; each is individually keyed and not master keyed.

2.7 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional-satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

2.8 CABINET HARDWARE

- A. General: Provide healthcare casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: [Stainless steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide two hinges for doors 48 inches (1200 mm) high or less, and provide three for doors more than 48 inches (1200 mm) high.
- C. Continuous Hinges: Stainless-steel continuous hinges complying with BHMA A156.9, Grade 1. Provide for narcotics cabinets

- D. Hinged Door and Drawer Pulls: Back-mounted pulls of stainless steel, .
 - 1. Design: Wire pulls
 - 2. Overall Size: As selected from manufacturer's full range
- E. Door Catches: Dual, self-aligning, permanent magnet catches. Provide two catches on doors more than 48 inches (1200 mm) high.
- F. Drawer Slides: Side-mounted, zinc-plated steel, self-closing, ball-bearing drawer slides; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.
 - 1. Provide Grade 1 for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
 - 2. Provide Grade 1HD-100 for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
 - 3. Provide full-extension type where Grade 1 is indicated.
 - 4. Provide full-extension type where Grade 1HD-100 or Grade 1HD-200 is indicated.
- G. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches (25 by 50 mm), attached with screws or rivets. Provide where indicated.
- H. Locks: Manufacturer's standard, individually mounted, cam style lock removable lock plug; locks keyed alike with two keys per lock .
 - 1. Provide locks where indicated.
 - 2. Keying: Key locks as directed.
 - 3. Master Key System: Key all locks to be operable by master key.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of healthcare casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

- A. Install cabinets level, plumb, and true; shim as required, using concealed shims. Where healthcare casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
 - 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).

3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
 4. Variation of Adjacent Cabinet Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).
- B. Recessed Cabinets: Set cabinets in openings and fasten to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- C. Base Cabinets: Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 16 inches (400 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through the back, near the top, at not less than 16 inches (400 mm) o.c.
- E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- F. Adjust healthcare casework and hardware so doors and drawers align and operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING AND PROTECTION

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish as approved by Architect.

END OF SECTION 123570

SECTION 123616 - METAL COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes stainless-steel countertops, shelves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal countertops only after casework has been completed in installation areas.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304

2.2 STAINLESS-STEEL COUNTERTOPS, SHELVES

- A. Countertops: Fabricate from 0.062-inch- (1.59-mm-) thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25 mm) over the base cabinets.
 - 1. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
 - 2. Weld shop-made joints.
 - 3. Sound deaden the undersurface with heavy-build mastic coating.
 - 4. Extend the top down to provide a 1-inch- (25-mm-) thick edge with a 1/2-inch (12.7-mm) return flange.
 - 5. Form the backsplash coved to and integral with top surface, with a 1/2-inch- (12.7-mm) thick top edge and 1/2-inch (12.7-mm) return flange.

- B. Wall-Mounted Shelves: Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Weld shop-made joints. Fold down the front edge a minimum of 3/4 inch (19 mm); fold up the back edge a minimum of 3 inches (75 mm). Provide integral stiffening brackets, formed by folding up ends a minimum of 3/4 inch (19 mm) and by welding to upturned front and back edges.

2.3 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

- C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
- D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
- F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 inches (600 mm) o.c.

3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 123616

SECTION 12 3661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops and backsplashes.
2. Solid surface window sills.

A. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator's Qualifications: Engage a qualified fabricator, acceptable to the Architect, that is an AWI-member firm; that has not less than 10 years' experience in the custom fabrication and installation of architectural woodwork comparable to that indicated, on not less than 5 projects, acceptable to the Architect, that are comparable in material, design, and extent to that indicated; that has production facility with capacity to produce required units without causing delay in the Work; and whose work has resulted in construction with a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS, SS-1

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of countertops indicated for construction, finishes, installation, and other requirements.
- B. Solid Surface Material: Homogeneous-filled plastic resin complying with IFSA 2-01.
 - 1. Products and Manufacturers: Subject to compliance with requirements, provide solid surfacing materials matching Architect's samples, which have been selected from the product lines and manufacturers indicated in Finish Schedule on Drawings, or comparable products as approved by Architect.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- D. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Premium.
- B. Countertops: 3/4-inch-thick, solid surface material with front edge built up with same material.
- C. Backsplashes: 3/4-inch-thick, solid surface material.
- D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
- E. Joints: Fabricate countertops in sections for joining in field.
 - 1. Joint Locations: Not within 18 inches of a sink and not where a countertop section less than 36 inches long would result, unless unavoidable.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - 2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 SOLID-SURFACE-MATERIAL WINDOW SILLS

- A. Window sills: 1/2-inch thick, solid surface material.
- B. Fabrication: Fabricate window sills in one piece unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.4 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - a. Verify adhesives have a VOC content of 70 g/L or less.
 - b. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 9200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- I. Apply sealant to gaps at walls; comply with Section 07 9200 "Joint Sealants."

END OF SECTION

SECTION 12 4813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient entrance mats.
 - 2. Surface mounted frames.

1.2 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.
- B. Shop Drawings:
 - 1. Items penetrating floor mats and frames, including door control devices.
 - 2. Divisions between mat sections.
- C. Samples: For the following products, in manufacturer's standard sizes:
 - 1. Floor Mat: Assembled sections of floor mat.
 - 2. Frame Members: Sample of each type and color.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient-Tile Entrance Mats: Full-size tile units equal to 2 percent of amount installed, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform floor load of 300 lbf/sq. ft..
 - 2. Wheel load of 350 lb per wheel.
- B. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design".

2.2 RESILIENT ENTRANCE MATS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide resilient entrance mats as indicated on the Finish Schedule on the Drawings or comparable product as approved by Architect.
- B. Carpet-Type Mats: Carpet bonded to 1/8- to 1/4-inch-thick, flexible vinyl backing to form mats 3/8 or 7/16 inch thick with nonraveling edges.
 - 1. Colors, Textures, and Patterns: As selected by Architect from full range of industry colors.
 - 2. Mat Size: As indicated.

2.3 RESILIENT-TILE ENTRANCE MATS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide resilient tile entrance mats as indicated on the Finish Schedule on the Drawings or comparable product as approved by Architect.
- B. Carpet-Type Tiles: Carpet bonded to 1/8- to 1/4-inch-thick, flexible vinyl backing to form mats 3/8 or 7/16 inch thick with nonraveling edges.
 - 1. Colors, Textures, and Patterns: As selected by Architect from full range of industry colors.
 - 2. Tile Size: As indicated.

2.4 FRAMES

- A. Surface-Mounted Frames:
 - 1. Tapered Frames: Taperedaluminum frame members, not less than 2 inches wide with welded mitered corners.
 - a. Aluminum Color: Mill finish.

2.5 CONCRETE FILL AND GROUT MATERIALS

- A. Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed and surface mounted mats and frames. Use aggregate no larger than one-third fill thickness.

2.6 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Surface-Mounted Frames: As indicated for permanent surface-mounted installation, complete with corner connectors, splice plates or connecting pins, and postinstalled expansion anchors.
- C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

2.7 ALUMINUM FINISHES

- A. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.
 - 1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

SECTION 12 93 00 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: SEE SCHEDULE.
- B. Related Requirements:
 - 1. Section 03 3000 "Cast-in-Place Concrete" for installing pipe sleeves cast, installing anchor bolts cast, formed voids in concrete footings.
 - 2. Section 05 5000 "Metal Fabrications."
 - 3. Section 06 2013 "Exterior Finish Carpentry."

1.3 PRE-INSTALLATION MEETINGS

- A. Pre-installation Meeting: Conduct meeting at Project Site, Manufacturer's Facility of Fabricator's Shop. Confirm with Owner and Landscape Architect 14 days prior to conference.
 - 1. Before submitting submittals, review submittals, mockup and other requirements of this section and examine procedures for ensuring quality of the scope herein. Require representatives of each entity directly concerned with the scope herein, including but not limited to, the following:
 - a. Contractor's superintendent.
 - b. Subcontractor.
 - c. Special Subcontractor.
 - d. Independent testing agency responsible for testing.
 - e. Product manufacturer and/or local representative.
 - f. Authority Having Jurisdiction.
 - g. Landscape Architect.
 - 2. Review methods and procedures related to the work of this section, including but not limited to, the following:
 - a. Responsibilities of each party.
 - b. Coordination of Landscape Architect's review of the work, including but not limited to:
 - 1) Site or Shop Visits to Review Samples and Mockups
 - 2) Site Visits to Observe General Construction Progress
 - 3) Site or Shop Visits to Review Fabrication Progress

- 4) Site Visits to Review First Work In Place
 - 5) Site Visits for Punch List Review
 - 6) Site Visits for Punch List Completion Review
 - 7) Site Visit for Warranty Review
- c. Lines of authority and communication for the project. Procedures for resolution of any project document ambiguity.
 - d. Methods for documenting, reporting, and distributing documents and reports.
 - e. Proposed sources of materials.
 - f. Procedures for packaging and storing archive samples.
 - g. Review of the time schedule for all installation and testing. Schedule of workdays and/or starting times if third party testing verification is required.
 - h. Quality control.
 - i. Temperature and weather limitations. Installation procedures for adverse weather conditions. Defining acceptable subgrade or ambient moisture and temperature conditions for working during installation.
 - j. Subgrade conditions, dewatering responsibilities, and subgrade maintenance plan.
 - k. Deployment techniques including allowable subgrade conditions.
 - l. Construction, material placement, and backfilling.
 - m. Requirements for protecting work, including restriction of traffic and adjacent work impacting during installation period and for remainder of construction period.
 - n. Measurement and payment schedules.
 - o. Health and safety.
 - p. Procedures and responsibilities for preparation and submission of as-built drawings.

1.4 COORDINATION

- A. Refer to Division 1 Requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Manufacturer's Product Literature and Specification Data.
 2. Manufacturer's written instructions for recommended maintenance practices.
 3. Color and finish samples for verification and selection.
 4. Written manufacturer's warranty.
 5. Product liability insurance certificate with project owner as certificate holder.
 6. MSDS for items in Part 2 "Products."
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish, not less than 6-inch- (152-mm-) long linear components and 4-inch- (102-mm-) square sheet components.

- E. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- F. Shop Drawings: Prepared by or under the supervision of a qualified professional, detailing fabrication and assembly.
 - 1. Submit shop drawings within a reasonable time so as not to delay the start of material fabrication and installation.
 - 2. Submit shop drawings per above allowing a minimum review time of 10 business days for review and response. Per above, also allow enough time for revisions and resubmittal where reasonably predictable.
 - 3. Shop drawings shall show the proposed layout identifying all components and details based on field verified conditions and measurements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, Fabricator and Manufacturer.
- B. Material Certificates: For site furnishings manufactured with preservative-treated wood.
 - 1. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- A. Field quality-control and special inspection reports.
- B. Minutes of pre-installation conference.
- C. Maintenance Instructions.
- D. Warranty: Written manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: From Installer including a recommended maintenance plan with procedures for inspection and care during a calendar year. Submit before start of required warranty and maintenance periods

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Bench Replacement Slats, Planks: No fewer than two full-size units for each size indicated.
 - 2. Trash Receptacle Inner Containers: Five full-size units for each size indicated, but no fewer than two units.
 - 3. Anchors: 10 Of each type.

1.9 QUALITY ASSURANCE

- A. Contractor shall establish and maintain a quality assurance program for the purposes of managing the quality of the work. Quality assurance program shall consist of plans, procedures and organizational design necessary to ensure that work of this Section meets the prescriptive and performance requirements specified. The Quality Control, Source Quality Control and Site Quality Control provisions specified elsewhere in this Section shall form part of the Quality Assurance Program.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Authorities Having Jurisdiction for all work included in this section.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- C. Codes and Standards: Conform work to all applicable codes and standards.
- D. Manufacturer Qualifications: Provide manufacturer qualifications as follows:
 - 1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
 - 2. Submit qualifications of manufacturer.
 - 3. Submit manufacturer's quality control program.
 - 4. Submit example of Material Warranty and any other applicable warranties.
- E. Installer Qualifications: Provide installer qualifications as follows:
 - 1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
 - 2. Submit resumes and/or qualifications of installation manager(s).
 - 3. Submit fabrication quality control program.
 - 4. Submit installation quality control program.
 - 5. Submit example of Material Warranty and any other applicable warranties.
- F. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified for testing indicated. Provide testing agency qualification as follows:
 - 1. Submit a list of ten completed installations. For each installation provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility familiar with the installation.
 - 2. Submit resumes and/or qualifications of testing manager(s).
 - 3. Submit testing quality control program.
 - 4. Submit example of Material Warranty and any other applicable warranties.

1.10 SEQUENCING AND SCHEDULING

- A. General: Prior to the start of Work, prepare a detailed schedule of the work for coordination with other trades.
- B. Schedule all utility installations prior to beginning work in this section.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged products in an undamaged condition in original containers, displaying manufacturer's labels, along with instructions for handling, storing, unpacking, protecting, and installing.
- B. Deliver and store materials in manufacturer's original containers, with seals unbroken and identification labels intact until time of use.
- C. Deliver products to achieve the shortest duration of storage time as practicable.
- D. Deliver all chemical products in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in weather protected enclosure.
- E. Comply with manufacturer's written instructions for delivery, storage, and handling, and as required to prevent damage to products and work during construction.
- F. Store products and materials in a neat and orderly manner. Maintain clear aisles and access to work areas. Protect stored products from theft and damage. Store products above ground in weathertight, ventilated packaging or enclosures.
- G. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- H. Store liquids in tightly closed containers protected from freezing.
- I. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- J. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Do not move or handle materials when they are wet or frozen.
- K. Accompany each delivery of bulk materials with appropriate certificates.

1.12 FIELD CONDITIONS

- A. Existing Utilities: do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than [two] <Insert number> days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- B. Field Measurements: Verify actual locations of all site elements and other construction contiguous with the work of this section prior to fabrication and/or installation.
- C. The work shall not occur in the presence of standing water, mud, snow, or frozen subgrade conditions. Work shall not occur while precipitation is occurring or during excessive winds, or when temperatures are outside the limits specified in this specification. Work completed during these conditions will be rejected.
- D. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- E. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- F. Hot-Weather Requirements: Comply with hot-weather construction requirements.

1.13 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the utility locate services is required for all Excavation and grading deeper than 12 inches: The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the local utility locator service.

1.14 OBSERVATION OF THE WORK

- A. The Landscape Architect may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.

- B. The Landscape Architect shall be informed of the progress of the work so the work may be observed during key times in the construction process. The Landscape Architect shall be afforded sufficient time to schedule visits to the site. Failure of the Landscape Architect to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1.15 FIRST WORK IN PLACE

- A. The Landscape Architect shall be informed once the first work in place has been completed for all individual elements included in this section for review to ensure the work is proceeding in accordance with the approved samples and mockups and per the Contract Documents. The Landscape Architect shall be afforded sufficient time to schedule visits to the site for review. In the event that sufficient time cannot be provided the Contractor shall provide images from multiple angles and perspectives of the work for Landscape Architect review.

1.16 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering and wear.
 - b. Separation or delamination of materials and components.
 - 2. Warranty Period: One years from date of Substantial Completion.

1.17 MAINTENANCE SERVICE

- A. Contractor to provide standard industry maintenance on all scope items herein until Final Acceptance.

PART 2 - PRODUCTS – SEE SCHEDULE

2.1 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment: Pressure-treat wood according to AWPA U1, Use Category UC3b, and the following:
 - 1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.2 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended, so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWP A M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.3 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 ALUMINUM FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.5 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

- B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.6 IRON FINISHES

- A. Powder-Coat Finish: Manufacturer's standard polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.7 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run directional finishes with long dimension of each piece.
 - 2. Directional Satin Finish: No 4.
 - 3. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to installation examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
- B. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.
- C. Confirm that no adverse drainage conditions are present.
- D. Confirm that no conditions are present which are detrimental to plant growth.
- E. Confirm that utility work has been completed per the drawings.
- F. If unsatisfactory conditions are encountered, notify the Landscape Architect immediately to determine corrective action prior to proceeding.

3.2 COORDINATION WITH PROJECT WORK

- A. The Contractor is responsible for investigating, and being aware of, the work requirements of their sub-contractors and other contractors. The Contractor shall coordinate with all other work that may impact the completion of the work herein.

- B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.

3.3 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and positioned at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.5 GRADE AND ELEVATION CONTROL

- A. Provide grade and elevation control during installation of the work of this section. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.6 REPAIR AND REPLACEMENT

- A. General: Repair or replace that is damaged by construction operations, in a manner approved by Landscape Architect.

3.7 WASTE HANDLING

- A. General: Handle waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

3.8 CLEANING

- A. The contractor should clean the job site and remove any excess materials. Coordinate with Owner for storage locations for any Attic Stock materials where applicable.

3.9 PROTECTION

- A. Contractor shall furnish and install construction fence around new installations to prevent access. Fencing shall be maintained in place for a minimum of 48 hours after completion of installation, or as directed by the Landscape Architect. Drying period may take longer due to weather conditions.
- B. Contractor shall notify Landscape Architect that landscape irrigation shall be restricted near installations until applicable drying period is complete. Standing water on installations shall be restricted at all times.

3.10 MAINTENANCE SERVICE

- A. Maintenance Service: Provide maintenance by skilled employees of Installer or approved Subcontractor. Maintain as required in "Maintenance" Article. Begin maintenance immediately after scope is installed and continue until final acceptance.

3.11 DEMONSTRATION AND TRAINING

- A. Engage a manufacturer-authorized service representative and/or other authorized professional to train Owner's maintenance personnel to adjust and operate all components herein.
- B. Train Owner's maintenance personnel in proper maintenance procedures for all components herein.

END OF SECTION - 12 93 00

SECTION 13 19 13 – KENNEL ENCLOSURES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Include:

1. Kennel Enclosures and Gates.
2. Ceiling Mesh Panels
3. Resting Benches

B. Related Requirements:

1. Section 04 22 00 "Concrete Block Masonry" for wall-mounted support.

1.2 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.

1.3 QUALITY ASSURANCE

- A. Installer's responsibility includes verifying Shop Drawing measurements with as-built rough-in measurements.
- B. Installer to provide a letter from the manufacturer certifying that he is experienced in installing their materials.
- C. Manufacturer to provide a letter certifying that the installation of their product on this project is consistent with their recommended installation procedures.
- D. Necessary miscellaneous metal, means or methods not shown in the Drawings for complete installations per the scope of work in the Project.

1.3 DELIVERY, STORAGE AND HANDLING

- ##### A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S

- ##### A. Per Schedule in Drawings.

1. Mason Company, animalhealth@midmark.com, 260 Depot St., Leesburg, OH 45135 (800) 543-5567
2. Shor-Line, ncentralterritory@shor-line.com, 511 Osage Avenue, Kansas City, Kansas 66105 (800) 444-1579
3. KennelDoors.com, kenneldoors.com, 3170 Airport Rd, La Crosse, WI 54603, (800) 829-7876

2.2 KENNEL EQUIPMENT

A. Kennel Doors

1. Single stall fronts with full width door with one-way SSK latch. All gates shall be hinged by the pivotal method and swing 180 degrees.
2. Transfer door to exterior: Locking, insulated guillotine door with weather baffles and pulley mechanism to facilitate remote operation.

B. Ceiling Panels

1. Galvanized steel wire mesh in Dog Isolation and exterior dog isolation runs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames, blocking and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine equipment before installation. Reject equipment that is wet, moisture damaged, mechanically damaged, cosmetically damaged and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. In accordance with layout shown on Drawings and in strict conformity with the manufacturer's recommendations.
- B. Furnish necessary blocking, filler pieces, angles, moldings, and other finish items for complete installation and faultless operation of the equipment.

END OF SECTION 13 19 13

SECTION 13 19 20 – CAGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless Steel and Fiberglass Cages, including cage, viewing screen, gates, and accessories as required by Drawings and as specified in this section.

B. Related Requirements:

1. Section 04 22 00 "Concrete Block Masonry" for support wall-mounted support.
2. Section 09 29 00 "Gypsum Board" for wall-mounted support.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Submit Shop Drawings, including details and sample of each item of equipment and hardware for Architect's approval.
2. Submit the product data, including complete manufacturer catalog and data sheet, complete parts list, and installation requirements for each accessory item specified.

1.3 QUALITY ASSURANCE

- A. Installer's responsibility includes verifying Shop Drawing measurements with as-built rough-in measurements.
- B. Manufacturer to provide a letter certifying that the installation of their product on this project is consistent with their recommended installation procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S

A. Per Schedule in Drawings.

1. Mason Company, animalhealth@midmark.com, 260 Depot St., Leesburg, OH 45135 (800) 543-5567
2. Midmark, animalhealth@midmark.com, 1001 Asbury Dr., Buffalo Grove, IL 60089 (847) 415 9800

2.2 CAGES

- A. Per schedule in Drawings
- B. Trim accessories for finished appearance between cages and surrounding wall.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames, blocking and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine equipment before installation. Reject equipment that is wet, moisture damaged, mechanically damaged, cosmetically damaged and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. In accordance with layout shown on Drawings and in strict conformity with the manufacturer's recommendations.
- B. Furnish necessary blocking, filler pieces, angles, moldings, and other finish items for complete installation and faultless operation of the equipment.

END OF SECTION 13 19 20