

Project Manual

Construction Documents

Liberty Public Schools District Technology Remodel

1000 Kent Street
Liberty, Missouri 64068

Prepared For:

Liberty Public Schools
8 Victory Lane
Liberty, Missouri 64068

HM Project No: 23022
Issue Date: August 31, 2023

Contents:

Volume 1: Introductory Information, Bidding and Contracting Requirements,
Division 1 through Division 12.

Volume 2: Division 22 through Division 32.



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SECTION 000101 - PROJECT TEAM DIRECTORY

PART 1 - GENERAL

1.1 CONSTRUCTION MANAGER INFORMATION

- A. Newkirk Novak Construction Partners has been selected as the Construction Manager for this project, and as such, will act as the Owner's representative.
- B. All communication, both written and oral, must be directed through the Construction Manager.

1.2 PROJECT TEAM INFORMATION

- A. **PROJECT:**
 - 1. Name: District Technology Remodel
 - 2. Location: 1000 Kent Street , Liberty , Missouri 64068
 - 3. Project No: 23022
- B. **OWNER:**
 - 1. Name: Liberty Public Schools
 - 2. Address: 8 Victory Lane, Liberty , Missouri 64068
 - 3. Contact: Steve Aldrich, Director of Facilities and Grounds or Justin Presson, Project Manager
 - 4. Phone: 816.736.5448
- C. **CONSTRUCTION MANAGER:**
 - 1. Name: Newkirk Novak Construction Partners
 - 2. Address: 11200 W. 79th Street, Lenexa, Kansas 66241
 - 3. Contact: Brandon Staley
 - 4. Email: Brandon.Staley@newkirknovak.com
 - 5. Phone: 913.312.9535.
- D. **ARCHITECT:**
 - 1. Name: Hollis + Miller Architects, Inc.
 - 2. Address: 1828 Walnut Street, Suite 922, Kansas City, MO 64108.
 - 3. Contact: Hillary L'Ecuyer
 - 4. Email: HLEcuyer@HollisandMiller.com
 - 5. Phone: 816.442.7700 / Fax: 816.599.2545
- E. **CIVIL ENGINEER:**
 - 1. Name: MKEC Engineering, Inc.
 - 2. Address: 11827 W 112th Street, Suite 200, Overland Park, Kansas 66210.
 - 3. Contact: Braden Taylor
 - 4. Email: btaylor@mkec.com
 - 5. Phone: 913.317.9390.
- F. **STRUCTURAL ENGINEER:**
 - 1. Name: Hollis + Miller Architects, Inc.
 - 2. Address: 1828 Walnut Street, Suite 922, Kansas City, MO 64108.
 - 3. Contact: Hannah Jones
 - 4. Email: hjones@hollisandmiller.com
 - 5. Phone: 816.442.7700 / Fax: 816.599.2545
- G. **MEP ENGINEER:**
 - 1. Name: Smith and Boucher
 - 2. Address: 25618 W 103rd Street, Olathe, Kansas 66061.
 - 3. Contact: Ryan Diediker.
 - 4. Email: rdiediker@smithboucher.com
 - 5. Phone: 913.345.2127.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 000101

SECTION 000105 - CERTIFICATIONS PAGE

ARCHITECT

I HEREBY, PURSUANT TO RSMO 327.411, STATE THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 1 SECTIONS:	011000, 012100, 012200, 012300, 012500, 013100, 013200, 013233, 013300, 014000, 014200, 014529, 016000, 017419, 017700, 017823, 017839, 017900.
DIVISION 2 SECTION:	024119.
DIVISION 3 SECTION:	-
DIVISION 4 SECTION:	040100.
DIVISION 5 SECTION:	055000.
DIVISION 6 SECTIONS:	62023, 066400.
DIVISION 7 SECTIONS:	072419, 072500, 072726, 074400, 076200, 078413, 078446, 079200.
DIVISION 8 SECTIONS:	081113, 081416, 084113, 085613, 088000.
DIVISION 9 SECTIONS:	092116, 092900, 093000, 095113, 096513, 096519, 096723, 096813, 097723, 099113, 099123, 099600.
DIVISION 10 SECTIONS:	101100, 101400, 101423, 102113, 102600, 102800, 104413, 104416.
DIVISION 11 SECTION:	-
DIVISION 12 SECTIONS:	122113, 123200, 123666
DIVISION 32 SECTIONS:	323113, 323119

I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

KEVIN NELSON _____

AUGUST 31, 2023 _____

ARCHITECT

DATE



AUGUST 31, 2023

CERTIFICATION PAGE

STRUCTURAL ENGINEER

I HEREBY STATE, PURSUANT TO RSMO 327.411, THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 3 SECTION: 033000.
DIVISION 4 SECTION: 042000
DIVISION 5 SECTION: 051200, 054000
DIVISION 6 SECTION: 061000.

I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.

DAVID KRELL

AUGUST 31, 2023

STRUCTURAL ENGINEER

DATE



SECTION 000105 – CERTIFICATIONS & SEALS

Civil Engineer:

I hereby state, pursuant to RSMo 327.411, that the Specifications intended to be authenticated by my seal are limited to Specification Sections listed below:

Division 31 Sections: 311000 & 312000
Division 32 Sections: 321216, 321313, 321373
Division 33 Sections: 333100 & 334100

I hereby disclaim any responsibility for all other specifications, drawings estimates, reports, or other documents or instruments relating to or intended to be used for any part or parts of the architectural or engineering project or survey.

Engineers:

Date



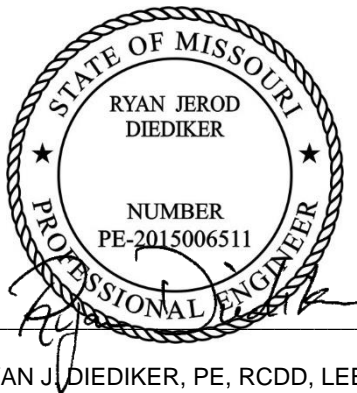
SECTION 000105 - CERTIFICATIONS PAGE-MEP

MEP ENGINEER

I HEREBY, PURSUANT TO RSMO 327.411, STATE THAT THE SPECIFICATIONS INTENDED TO BE AUTHENTICATED BY MY SEAL ARE LIMITED TO SPECIFICATIONS LISTED BELOW:

DIVISION 22 SECTIONS:	220500, 220513, 220516, 220519, 220523, 220529, 220553, 220719, 221116, 221119, 221123, 221316, 221319, 223300, 224000, 224700
DIVISION 23 SECTIONS:	230500, 230529, 230553, 230593, 230713, 230719, 230900, 232113, 232300, 233113, 233300, 233416, 233600, 233713, 236200, 237313.13, 238123.18, 238239
DIVISION 26 SECTIONS:	260010, 260519, 260526, 260529, 260533.13, 260533.16, 260536, 260544, 260553, 260923, 262416, 262716, 262726, 262816, 263213.13, 263600, 265119
DIVISION 27 SECTIONS:	270010, 270528, 271100, 271513
DIVISION 28 SECTIONS:	280500, 280513, 283111

I HEREBY DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER SPECIFICATIONS, DRAWINGS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE ARCHITECTURAL OR ENGINEERING PROJECT OR SURVEY.



08.31.2023

RYAN J. DIEDIKER, PE, RCDD, LEED AP

DATE

DOCUMENT 000110 – TABLE OF CONTENTS

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Project No.: 23022
Site Address 1000 Kent Street
City, State Zip Liberty, Missouri 64068

Revisions	Date

Latest Revision Original Issue

INTRODUCTORY INFORMATION

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000105	Certifications and Seals	08.31.2023
000110	Table of Contents	08.31.2023

BIDDING REQUIREMENTS

(Refer to Construction Manager's Front End Manual for additional Bidding Requirements)

CONTRACTING REQUIREMENTS

(Refer to Construction Manager's Front End Manual for additional Contracting Requirements)

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012300	Alternates	08.31.2023
012500	Substitution Procedures	08.31.2023
013100	Project Management and Coordination	08.31.2023
013200	Construction Progress Documentation	08.31.2023
013233	Photographic Documentation	08.31.2023
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014529	Testing and Inspections	08.31.2023
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017700	Closeout Procedures	08.31.2023
017823	Operation and Maintenance Data	08.31.2023
017839	Project Record Documents	08.31.2023
017900	Demonstration and Training	08.31.2023

DIVISION 2 – EXISTING CONDITIONS

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DIVISION 3 – CONCRETE

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DIVISION 4 - MASONRY

040100	Masonry Restoration and Cleaning	08.31.2023
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054000	Cold-Formed Metal Framing	08.31.2023
055000	Metal Fabrications	08.31.2023

DIVISION 6 – WOOD AND PLASTICS

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062023	Interior Finish Carpentry	08.31.2023
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076200	Sheet Metal Flashing and Trim	08.31.2023
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078446	Fire Resistive Joint Systems	08.31.2023
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087100	Door Hardware	08.31.2023
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DIVISION 9 - FINISHES

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093000	Tiling	08.31.2023
095113	Acoustical Panel Ceilings	08.31.2023
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096519	Resilient Tile Flooring	08.31.2023
096723	Resinous Flooring	08.31.2023
096813	Tile Carpeting	08.31.2023
097723	Fabric-Wrapped Panels	08.31.2023
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220513	Common Motor Requirements for Plumbing Equipment	08.31.2023
220516	Expansion Fittings and Loops for Plumbing Piping	08.31.2023
220519	Meters and Gauges for Plumbing Piping	08.31.2023
220523	General Duty Valves for Plumbing Piping	08.31.2023
220529	Hangers and Supports for Plumbing Piping and Equipment	08.31.2023
220553	Identification for Plumbing Piping and Equipment	08.31.2023
220719	Plumbing Piping Insulation	08.31.2023
221116	Domestic Water Piping	08.31.2023
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260533.13	Conduits for Electrical Systems	08.31.2023
260533.16	Boxes and Covers for Electrical Systems	08.31.2023
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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Work by Owner.
 - 4. Access to site.
 - 5. Coordination with occupants.
 - 6. Work restrictions.
 - 7. Specification and drawing conventions.
 - 8. Miscellaneous provisions.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

- A. Project Identification: District Technology Remodel
 - 1. Project Address: 1000 Kent Street, Liberty, Missouri 64068 .
- B. Owner: Liberty Public Schools
 - 1. Owner's Address: 8 Victory Lane , Liberty , Missouri 64068 .
 - 2. Owner's Representative: Steve Aldrich, Director of Facilities and Grounds .
- C. Architect:
 - 1. Refer to Document 000101 "Project Team Directory."
- D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. Refer to Document 000101 "Project Team Directory."
- E. Construction Manager:
 - 1. Refer to Document 000101 "Project Team Directory."
 - 2. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. General: All demolition, sitework, architectural, structural, fire suppression, plumbing, mechanical, electrical, access control, technology and utilities as indicated in the Contract Documents and as further defined in the Scopes of Work.
 - 2. Alternates: Refer to Section 012300 "Alternates".
- B. Type of Contract:
 - 1. Project will be constructed under a multiple trade contract.

1.4 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

- B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Concrete and asphalt work.

1.5 OWNER-FURNISHED, CONTRACTOR INSTALLED PRODUCTS (OFICI)

- A. Owner-Furnished, Contractor installed items shall be as indicated in Drawings.

1.6 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine construction operations to areas indicated and as directed by Construction Manager.
 - 2. Driveways, Walkways, and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Restrictions: Note that no deliveries to the Project Site will be allowed between the hours of 7:00 am to 8:30 am and 2:00 pm to 3:30 pm.
 - b. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - c. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Weekend Hours: Coordinate and schedule all weekend hours with the Owner not less than 48 hours in advance. Comply with regulations of authorities having jurisdiction.
 - 2. Early Morning Hours: Notify Owner of days when early morning hours will be required and comply with regulations of authorities having jurisdiction.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than three (3) days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Architect and Owner not less than three (3) days in advance of proposed disruptive operations.

2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Buildings and Sites: Smoking is not permitted on School District property.
- F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 1. Maintain list of approved screened personnel with Owner's representative.
 2. As a condition for the award of any service contract in excess of \$5,000.00 by the Owner, the service provider must be enrolled in and currently participating in "E-Verify" or any other equivalent electronic verification of work authorization program operated by the U.S. Department of Homeland Security.
 3. As a further condition for the award of any service contract in excess of \$5,000.00 the service provider shall not knowingly employ any person who is an un-authorized alien in conjunction with the contracted services.
 - a. E-Verify forms are available for duplication and contractor's use in Section 008400 – Attachments.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 011000

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SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM AND UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

1. Sales and Use Taxes shall be omitted for this project.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner and/or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.
- D. Refer to "Bid Packages" for further clarification of required allowances.

1.7 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. General: Refer to individual Bid Package – Scopes of Work for Allowances.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.2 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes (other than sales and use tax), overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Refer to Individual Bid Package – Scopes of Work.

END OF SECTION 012200

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SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

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

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No.1: Mechanical Yard Fencing
 - 1. Alternate 1A (Add): Alternate includes all labor, materials, equipment and appurtenances necessary to demolish existing chain link fence and prep slab to receive new chain link fence with privacy slats at Mechanical Yard indicated on Drawings as Alternate No. 1A.
 - 2. Alternate 1B (Add): Alternate includes all labor, materials, equipment and appurtenances necessary to demolish existing chain link fence and prep slab to receive new wood composite privacy fence at Mechanical Yard indicated on Drawings as Alternate No. 1B.
 - 3. Base Bid: Uninstall, repair, and reinstall existing chain link fence during new MEP Equipment installaton.
- B. Alternate No.2: Fine Arts Suite
 - 1. Alternate (Deduct): Do not provide new work at Fine Arts Suite as indicated A801 of Drawings.
 - 2. Base Bid: All labor, materials, equipment and appurtenances necessary to provide new work in Fine Arts Suite areas indicated on A801.of Drawings
- C. Alternate No.3: Kid's Zone
 - 1. Alternate (Deduct): Do not provide new work at Kid's Zone Suite as indicated on A801 of Drawings.

2. Base Bid: All labor, materials, equipment and appurtenances necessary to provide new work in Kid's Zone Suite areas indicated on A801 of Drawings.

END OF SECTION 012300

SECTION 012500.01 - SUBSTITUTION PROCEDURES FORM

PROJECT: District Technology Remodel 1000 Kent Street Liberty ,Missouri 64068

MAIL TO: HOLLIS + MILLER ARCHITECTS, 1828 WALNUT STREET, SUITE 922, KANSAS CITY, MISSOURI 64108

SPECIFIED ITEM/ KEYNOTE #: _____

PROPOSED SUBSTITUTE: _____

SUBMITTED BY: _____

FIRM: _____

ADDRESS: _____

SIGNATURE: _____ **DATE:** _____

PHONE NUMBER: _____

ATTACH COMPLETE DESCRIPTION, DESIGNATION, CATALOG OR MODEL NUMBER, SPEC DATA SHEET AND OTHER TECHNICAL DATA AND SAMPLES, INCLUDING LABORATORY TESTS IF APPLICABLE.

FILL IN BLANKS BELOW:

1. WILL SUBSTITUTION AFFECT DIMENSION INDICATED ON DRAWINGS?
2. WILL SUBSTITUTION AFFECT WIRING, PIPING, DUCTWORK, ETC., INDICATED ON DRAWINGS?
3. WHAT EFFECT WILL SUBSTITUTION HAVE ON OTHER TRADES?
4. DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM?
5. ANY AND ALL IMPACTS ON COSTS, DESIGN MODIFICATIONS, ADDITIONAL ARCHITECTURAL AND ENGINEERING SERVICES, MATERIAL AND LABOR CHANGES, SCHEDULE CHANGES, AND OTHER UNANTICIPATED CONSEQUENCES, RESULTING FROM THIS SUBSTITUTION IN LIEU OF THE SPECIFIED ITEM, SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR AND HIS SUBCONTRACTORS AND SUPPLIER.

6. MANUFACTURER'S WARRANTIES OF THE SPECIFIED ITEMS AND PROPOSED ITEMS ARE: ☐ SAME OR
☐ DIFFERENT, *EXPLAIN:* _____

REVIEW COMMENTS:

☐ **NO EXCEPTION TAKEN TO SUBMITTED MANUFACTURER**

*MANUFACTURER ONLY, IS ACCEPTED DUE TO TIME LIMITATIONS FOR FULL REVIEW OF PRODUCT, OR
BECAUSE NO SPECIFIC PRODUCT DATA IS SUBMITTED, OR OTHER UNSPECIFIED REASONS. CONTRACTOR
MUST STILL BEAR FULL RESPONSIBILITY FOR COMPLIANCE WITH CONTRACT REQUIREMENTS.*

☐ **NO EXCEPTION TAKEN TO SPECIFIC PRODUCTS**

☐ **EXCEPTIONS NOTED**

SEE ATTACHED COPY OR NOTES ON PRODUCT LITERATURE

☐ **NOT ACCEPTED**

☐ **RECEIVED TOO LATE**

BY: _____ DATE: _____

REMARKS: _____

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for "Substitutions for Convenience" and "Substitutions for Cause".
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012200 "Unit Prices" for products selected under a unit price.
 - 3. Section 012300 "Alternates" for products selected under an alternate.
 - 4. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 5. Division 02 through 33 Sections for specific requirements and limitations for substitutions.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms. Substitutions for Cause shall be submitted after award of the contract as set forth hereinafter.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner. Substitutions for Convenience shall be submitted prior to bidding as set forth hereinafter.
- B. Comparable Products: Naming of specified items on the Drawings and in the specifications, means that such named items are specifically required by the Architect and/or Owner. When the words "or comparable product" follows such named item(s), a substitution request must be submitted when proposing a product other than the named product. Requests for substitutions must be received by the Architect within the time frame set hereinafter.
- C. The following are not considered substitutions:
 - 1. Revisions to Contract Documents requested by the Owner or Architect.
 - 2. Specified options of products, materials and construction methods included in the Contract Documents.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit at least one (1) paper copy or an electronic pdf copy of each request for consideration to the Architect. Clearly Identify proposed product and related options or fabrication or installation method to be replaced. Include Specification Section number and title, in addition to applicable Drawing numbers and titles.
 - 1. Substitution Request Form: Use facsimile of form provided at the end of this Section.
 - a. Accompanying each Substitution Request shall be a fully executed copy of the Substitution Request Form.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Specifically indicate deviations, if any, from the Work specified in writing.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested, of proposed substitution and of specified product shall be submitted for comparison and review by Architect.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names, addresses and contact information of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Review Process: Submittal requests for proposed substitutions will be processed using the following procedures:
- a. Submittals will be "Received Dated" immediately upon arrival.
 - b. Submittals will be placed by receiving person in a file designated for that purpose.
 - c. Submittals will not be reviewed for completeness or compliance until after the date and time established for closing of receipt of substitution request submittals.
 - d. Submittals will be reviewed by a member of Hollis + Miller Architect's staff (or respective consultant). Reviewer(s) will not be designated until after closing period established for receipt of submittals.
 - e. Reviewer's General Attitude will be:
 - 1) Burden of Proof is on Proposer.
 - 2) Reviewer should not be required to complete the submittal, that is, select from options or between models and lines of products.
 - 3) Reviewer should not be required to conduct an exhaustive review of the submittal. Submittals of manufacturer's catalogs which do not clearly indicate proposed product and proposed product options will be rejected.
 - 4) Reviewer should not be required to seek information from manufacturer's literature on file in the office, from an improperly submitted electronic submittal or information in other locations.
 - 5) Substitute must be "comparable to" or superior in those features and performance which the Project requires and those which the specified product will provide.
 - 6) Review is complete when, in the reviewer's opinion, significant deficiency(ies) are established. In such case, review of data covering other points of specifications is not required.
 - f. Reviewer will note action taken (No Exception taken to Submitted Manufacturer, No Exception taken to Specific Product, Exceptions Noted, Not Accepted or Received Late), the date, and his/her initials.
 - g. All submittals received after closing time will be "Received Dated", marked "Late", initialed by reviewer, and filed without review.
 - h. Submittals will be filed in Architect's office until completion of the Project.
4. Architect's Action:
- a. Architect will review requests for "Substitutions for Convenience" only once, no additional information may be submitted. Architect may request additional information as necessary for review of "Substitutions for Cause."
 - b. Architect will note action taken.
 - c. Architect is not obligated nor required to review any and all substitution requests.
 - d. Architect is not obligated to inform proposers of substitutions of incomplete and non-accepted requests for substitution.
 - e. Acceptance of Substitutions:
 - 1) Acceptance of Substitutions for Convenience: Accepted substitutions will be set forth in an Addendum and in no other manner.
 - (a) Use product specified if Architect does not issue a decision on use of a proposed substitution.
 - 2) Acceptance of Substitutions for Cause: Architect will review proposed substitution within 15 business days of receipt of request. If necessary, Architect, through Construction Manager, will request additional information or documentation for evaluation within seven (7) business days of

receipt of a request for Substitution for Cause.” Architect will notify Contractor through Construction Manager of acceptance of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

Only acceptable substitutions will receive notification of status. Substitutions shall be considered unacceptable unless a form of acceptance is received by the Proposer.

- (a) Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
- (b) Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 ELECTRONIC SUBMITTAL OF SUBSTITUTIONS

- A. Substitution Request submittals will be accepted for review when submitted electronically under the following conditions. Substitution requests which are not submitted in accordance with the criteria listed below may be rejected at the Architect's discretion.
 - 1. Accompanying each submittal shall be a fully executed copy of the Substitution Request Form.
 - 2. Submittals shall be sent to Hollis + Miller Architects, to the attention of the contact listed in Document 000101 "Project Team Directory. Submittals directed to the attention of anyone other than the contact listed will not be considered.
 - 3. Submittals of Substitutions for Cause must be received within the time limits set forth in Paragraph 2.1 A of this Section.
 - 4. Submittals of Substitutions for Convenience must be received prior to bidding and within the time limits set forth in Paragraph 2.1 B of this Section.
 - 5. Documentation requirements as set forth in 1.3 A.2a through 1.3 A.2m are applicable to electronic submittals.
 - a. Note: Electronic submittals in which the manufacturer's entire catalog is submitted will be rejected.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than thirty (30) days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect and Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Request is directly related to a "or comparable product" clause or similar language in the Contract Documents.
 - c. Specified product or method of construction cannot be provided within the Contract Time.
 - d. Specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
 - e. Specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution will provide the specified warranty.
 - f. Substitution request is fully documented and properly submitted.

- g. Requested substitution will not adversely affect Contractor's construction schedule.
 - h. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - i. Requested substitution is compatible with other portions of the Work.
 - j. Requested substitution has been coordinated with other portions of the Work.
 - k. Requested substitution provides specified warranty.
 - l. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution only when submitted prior to bidding, and no later than 4:00 p.m. (local time) eight (8) calendar days prior to the date established for receipt of bids. Requests received after that time may be considered or rejected at discretion of Architect.
- 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- C. The Contractor's submittal and A/E's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptance or validate request for substitution, nor does it constitute approval.
- D. Under no circumstances does the Architect's and/or Owner's acceptance of any such substitution relieve the Contractor from timely, full and proper performance of the Work.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012500

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. On-line Project file.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use form acceptable to Construction Manager. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within ten (10) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project. Keep list current at all times.
 - 1. Post paper copies of list in project meeting room, in temporary field office, and by each temporary telephone.
 - 2. Post electronic copy as PDF electronic files directly to Project file on the JE Dunn Submittal Portal website (<https://submittals.jedunn.com>) specifically established for Project.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Refer to Section 017419 "Construction Waste Management and Disposal" for additional requirements.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 10. Coordination Drawing Prints: As deemed necessary by Construction Manager, prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. BIM File Incorporation: Develop and incorporate coordination drawing files into Building Information Model established for Project.
 - a. Refer to individual Scopes of Work for Trades required to perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 4. Architect, through Construction Manager, will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit version 2023 using Windows 10 operating system.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

1.6 REQUESTS FOR INFORMATION (RFIS)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. Name of Construction Manager.
 7. RFI number, numbered sequentially.
 8. RFI subject.
 9. Specification Section number and title and related paragraphs, as appropriate.
 10. Drawing number and detail references, as appropriate.

11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 13. Contractor's signature.
 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or a software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly in form acceptable to Architect. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. Name and address of Construction Manager.
 5. RFI number including RFIs that were returned without action or withdrawn.
 6. RFI description.
 7. Date the RFI was submitted to the Architect.
 8. Date Architect's and Construction Manager's response was received.
- F. On receipt of Architect's and Construction Manager's action, immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven (7) days if Contractor disagrees with response.
1. Change in Work shall be recorded to the Project Record set per Section 017839 "Project Record Documents".

1.7 PROJECT MEETINGS

- A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three (3) days of the meeting.

- B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, and their consultants; each Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: 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 Architect, Construction Manager, and Owner's Commissioning Authority of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.

- o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Owner's partial occupancy requirements.
 - k. Installation of Owner's furniture, fixtures, and equipment.
 - l. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Construction Manager will conduct progress meetings at **biweekly** intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction 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 Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.

- 4) Status of submittals.
 - 5) Status of sustainable design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site utilization.
 - 10) Temporary facilities and controls.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Status of RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Construction Manager will conduct Project coordination meetings at **regular** intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work. Owner's Commissioning Authority, Construction Manager, and Architect will attend as deemed necessary.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction 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 Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
 - 2. Section 014529 "Testing and Inspections" for submitting a schedule of tests and inspections.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 2. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at monthly intervals.
- F. Material Location Reports: Submit at monthly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.
- H. Special Reports: Submit at time of unusual event.
 - 1. Adverse Weather Days: Document conditions effecting construction activities and submit within 24 hours of the event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages, area separations and interim milestones.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review submittal requirements and procedures.
 - 6. Review time required for review of submittals and resubmittals.
 - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 8. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 - 9. Review and finalize list of construction activities to be included in schedule.
 - 10. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 20 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner, if any.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Uninterruptible services.
 - c. Use of premises restrictions.
 - d. Provisions for future construction.
 - e. Seasonal variations.
 - f. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.

2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven (7) days of date established for the Notice to Proceed or Notice of Award, whichever is earlier.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Refer to Section 007300 for additional requirements.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities.
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.

6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed or the Notice of Award, whichever is earlier. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
 1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner, Architect and Construction Manager within two day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules 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 performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final completion construction photographs.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos by uploading to web-based project software site or via email. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.3 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time from camera.
- D. File Names: Name media files with date, Project area, and sequential numbering suffix.

1.4 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag construction limits before taking construction photographs.

2. Take a minimum of 20 photographs to show existing conditions adjacent to property before starting the Work.
 3. Take a minimum of 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- C. Periodic Construction Photographs: Take a minimum of 20 photographs biweekly. Select vantage points to show status of construction and progress since last photographs were taken.
- D. Final Completion Construction Photographs: Take a minimum of 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and Record Product Data.
 - 5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Digital File Transfer: Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. A cloud based ShareFile exchange which allows internal and external users to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.

- f. Scheduled date for Architect's and Construction Manager's final release or approval.
- g. Scheduled date of fabrication.
- h. Scheduled dates for installation.
- i. Scheduled dates for purchasing.
- j. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect, through the Construction Manager to Contractor, at a nominal cost, for use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit version 2023 using Windows 10 operating system.
 - c. Contractor shall execute a data licensing agreement form furnished by the Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. It is expected that the number of submittals sent to the Architect and the Architect's Consultants within any one-week period will be reasonable in number as to not create "undue hardship."
 - 2. It is expected that all submittals will be submitted within the durations outlined in the bid form as provided by each trade.
 - a. A \$100.00 per calendar day penalty will be assessed for any submittal received after durations received as provided by each trade. The penalty will be deducted from the contract through deductive change order. Only if written authorization from the Construction Manager to extend this time frame can this "per day" penalty not be enforced.
 - b. The completion time of the contract will not be extended for delays caused by tardiness of submittals. Cost of such delays shall not be borne by the Owner and may be back-charged as necessary.
 - 1) Contractor shall assume full responsibility for providing materials as specified at their risk to maintain schedule if submittals are not submitted within durations provided on the bid form.
 - c. Upon receipt of unapproved submittals, Contractors will have seven (7) calendar days to revise and resubmit. After such time, the penalty outlined above in 1.4 C.1.a will be assessed.
 - 3. Initial Review: Allow 10 **business** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
 - 4. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 5. Resubmittal Review: Allow 7 **business** days for review of each resubmittal.
 - 6. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 **business** days for initial review of each submittal.
 - 7. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 **business** days for review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., OMLC-079200.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., OMLC-079200.01.A).
 - b. Specific material/product identifier: After listing the project identifier and section number as described above, clearly indicate the material/product submitted corresponding to specific paragraph in the specification (e.g., Silicone Joint Sealant – 2.2 A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
 4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Options: Clearly identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - b. Along with the electronic submittal, Contractor shall submit to the Architect, one (1) full sized hard copy of each shop drawing for review and approval, as deemed necessary by the Architect.
 - c. Along with the electronic submittal, contractors shall submit to the Construction Manager, one (1) color deck or color card for each submittal requiring color selection for review, approval and color selection, as deemed necessary by the Architect.
 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
 3. Submittals shall constitute an implied statement by the General Contractor and Subcontractor that the submitted items comply with the following statements:
 - a. Items have been reviewed and accepted by the General Contractor and Subcontractor.
 - b. Items have been verified and coordinated with specifications, measurements, conditions, and relevant criteria of the Contract Documents.
 - c. Items can be fabricated and delivered to the project site within the proposed project schedule.
 4. Review of submittals by the Architect and/or Owner shall not relive the Contractor from full compliance with the Construction Documents.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to clearly show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts/decks.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples and Shop Drawings, as applicable.
 6. Submit Product Data in the following format:
 - a. PDF electronic file according to Paragraph 2.1 A.1.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.

- c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file according to Paragraph 2.1 A.1.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Sample for "initial selection" shall be listed as a separate item in the submittal schedule.
 - b. Number of Samples: Unless specifically required otherwise in Specification Section, submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
 - 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
 - 7. Electronic Transmittal: Provide PDF transmittal for all physical Samples. Include digital image file illustrating Sample characteristics, and identification information for record.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
- 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule in the following format:
 - a. PDF electronic file.

- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file in addition to three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
 - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

- A. Action Submittals: Contractor is responsible for conforming and correlating dimensions at job sites for tolerances, clearances, quantities, fabrication processes, coordination of the Work with multiple trades, and full compliance with the Contract Documents. The Architect will review submittals for general conformance with the Contract Documents. Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:
 - 1. No Exception Taken: Signifies item represented in the submittal conforms to the design intent, complies with the intent of the Contract Documents and is acceptable for incorporation into the Work. Contractor is to proceed with fabrication or procurement and related work.
 - 2. Exceptions Noted: Signifies item represented in the submittal conforms to the design concept, complies with the intent of the Contract Documents and is recommended for incorporation into the Work in accordance with the Architect's and/or Consultant's notations. Contractor is to proceed with the work in

- accordance the Architect's and/or Consultant's notations marked on the returned submittal or letter of transmittal. Resubmittal is not required.
3. Revised and Resubmit: Signifies item represented in the submittal appears to conform to the design concept and comply with the intent of the Contract Documents, but information is either insufficient or contains discrepancies which prevent the Architect and/or his Consultant from completing his review. Contractor is to resubmit revised information. Fabrication or procurement of the item and related work is not to proceed until the submittal is acceptable.
 4. Not Accepted: Signifies item represented in the submittal does not conform to the design concept or comply with the intent of the Contract Documents and is not recommended for incorporation into the Work. Contractor shall submit items responsive to the Contract Documents.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups/Field Samples: Full-size physical assemblies that are constructed on-site. Mockups/field samples are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups/Field Samples are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 - 2. Integrated Field Samples: Field samples of select portions exterior envelope or interior construction erected as part of the Work. Field samples may consist of multiple products, assemblies, and subassemblies.
 - 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means, unless otherwise specified in the individual specification section, having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality 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. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
 - 1. Whenever Contract Documents reasonably infer materials or installation as necessary to produce the intended results, but do not fully detail or specify such materials, the Contractor shall provide the more expensive method or material, or greater quantity, unless he has obtained a written decision from the Architect.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups/field samples, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. **Manufacturer's Technical Representative's Field Reports:** Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. **Factory-Authorized Service Representative's Reports:** Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. **Permits, Licenses, and Certificates:** For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

- A. **General:** Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
1. Refer to individual specification sections for additional requirements.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
 2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Unless otherwise indicated in the Contract Documents, demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
- M. Field Samples: Construct/apply field samples using required materials, products, finishes and assemblies, finished according to requirements for the completed work. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work:
1. Build field sample of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect three (3) days in advance of dates and times when field samples will be constructed/applied.

3. Notify Architect and Construction Manager seven (7) days in advance of dates and times when field sample will be constructed/applied.
4. Demonstrate the proposed aesthetic effects and workmanship to be incorporated into the Work.
5. Obtain Architect's approval of field sample before starting remainder of work.
 - a. Allow three (3) days for initial review and each re-review of each field sample.
6. Field samples not acceptable to Architect shall be re-constructed/re-applied until field sample is accepted to Architect.
7. Maintain field sample during construction in an undisturbed condition as a standard for judging the completed Work
8. Unless otherwise indicated in the Contract Documents, dispose of field sample when directed by Architect and Owner.

1.10 QUALITY CONTROL

- A. **Owner Responsibilities:** Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. **Contractor Responsibilities:** Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect, Commissioning Authority, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless 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 to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AABC - Associated Air Balance Council; www.aabc.com
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 - 8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.

9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.compositepanel.org.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).

69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarooft.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; www.iec.ch.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.

128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Federation of State High School Associations; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.
179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.

189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
 190. TMS - The Masonry Society; www.masonrysociety.org.
 191. TPI - Truss Plate Institute; www.tpinst.org.
 192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
 193. TRI - Tile Roofing Institute; www.tilerroofing.org.
 194. UL - Underwriters Laboratories Inc.; www.ul.com.
 195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 196. USAV - USA Volleyball; www.usavolleyball.org.
 197. USGBC - U.S. Green Building Council; www.usgbc.org.
 198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
 200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 203. WI - Woodwork Institute; www.wicnet.org.
 204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 205. WWPA - Western Wood Products Association; www.wwpa.org.
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 3. ICC - International Code Council; www.iccsafe.org.
 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 5. DOE - Department of Energy; www.energy.gov.
 6. EPA - Environmental Protection Agency; www.epa.gov.
 7. FAA - Federal Aviation Administration; www.faa.gov.
 8. FG - Federal Government Publications; www.gpo.gov/fdsys.
 9. GSA - General Services Administration; www.gsa.gov.
 10. HUD - Department of Housing and Urban Development; www.hud.gov.
 11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
 12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 13. SD - Department of State; www.state.gov.
 14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
 18. USP - U.S. Pharmacopeial Convention; www.usp.org.
 19. USPS - United States Postal Service; www.usps.com.
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 3. DSCC - Defense Supply Center Columbus; (See FS).
 4. FED-STD - Federal Standard; (See FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.

- c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 - 6. MILSPEC - Military Specification and Standards; (See DOD).
 - 7. USAB - United States Access Board; www.access-board.gov.
 - 8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
- 1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 - 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 - 3. CDHS; California Department of Health Services; (See CDPH).
 - 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 - 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 - 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 - 7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservation.tamu.edu.
 - 8. Colorado Department of Public Health & Environment; www.colorado.gov/pacific/cdphe
 - 9. Colorado Air Quality Control Commission; www.colorado.gov/pacific/cdphe/aqcc
 - 10. Colorado Water Quality Control Division; www.colorado.gov/pacific/cdphe/wqcd
 - 11. Colorado Geological Survey; Land Use Regulations; www.coloradogeologicalsurvey.org/land-use-regulations/

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 014200

SECTION 014529 - TESTING AND INSPECTIONS

PART 1 - GENERAL

1.1 GENERAL

- A. The preceding "General Conditions" are a part of these specifications and the Contractor shall consult them in detail in connection with this part of the work.

1.2 SCOPE OF WORK

- A. Employment of a testing and inspection firm approved and paid for by the Owner. Approximate scope of testing and inspection shall be as indicated on the drawings and herein specified in the sections of the specifications.
 - 1. Refer to attachment for scope of testing to be provided by Owner.

1.3 TESTING AND INSPECTION CHARGES

- A. For the following conditions, costs of testing and inspection services shall be paid for by the Contractor, apart from the Testing and Inspection.
 - 1. Costs arising from errors or omissions by the Contractor.
 - 2. Costs of concrete cores, of re-testing materials that fail, and of required identification of materials (mill tests, manufacturers certifications, etc.).
 - 3. Costs of test and inspections required to expedite the Contractors operations.

1.4 EARTHWORK

- A. The Soils Engineer shall be notified for inspection by the Contractor and shall work in cooperation with the Architect. This inspection shall be made before any excavation is attempted on the site. If any undesirable conditions are encountered during Construction, the Soils Engineer shall be notified so that supplemental recommendations can be made. Tests shall be made to define maximum densities of all compaction work. All densities shall be expressed as a relative compaction, in terms of the maximum dry density obtained in the laboratory. The Soils Engineer shall supervise all engineered fill, and make field tests to insure compliance with the required placement of footings; methods of placing and compacting fills; filter and/or rock fill materials.

1.5 CONCRETE WORK

- A. Reinforcement shall be positively identified by heat numbers and mill analysis. Otherwise, Contractor shall provide test by qualified laboratory, one test for each 5 tons or fraction thereof, each size and type of reinforcing steel. Cement shall be from tested bins and properly identified at the mixing plant. Contractor shall provide to the testing laboratory, aggregate samples for approval. Testing laboratory shall prepare 3 concrete cylinders for each 25 cubic yards, or fraction thereof placed – 2 cylinders to be tested at 7 days, and 1 cylinder at 28 days. Follow ASTM standards throughout.

1.6 GENERAL TESTS AND INSPECTIONS

- A. Observe all building code test and inspection requirements. Notify proper State, County and City authorities, for their required inspections.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 014529

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012200 "Unit Prices" for products selected under a unit price.
 - 3. Section 012300 "Alternates" for products selected under an alternate.
 - 4. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 5. Section 014200 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architects Action: For comparable products submitted for "Cause", if necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later. For comparable products submitted for "Contractor's Convenience", Contractor must submit all information necessary to make a direct comparison to specified product for Architect's review, no additional information may be submitted.
 - a. Form of Approval: As specified in Section 012500 "Substitution Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project 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, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered prior to bidding only.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 - 2. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered prior to bidding only.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 - 3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 EXECUTION (NOT USED)

END OF SECTION 016000

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition waste.
 - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

1.2 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. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 INFORMATIONAL SUBMITTALS

- A. 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.
- B. 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.

1.4 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (NOT USED)

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 and Controls."

- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Store items in a secure area until delivery to Owner.
 - 3. Transport items to Owner's storage area designated by Owner.
- 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 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.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for progress cleaning of Project site.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings and record Product Data.
 - 4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are

outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Page number.
4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect, through Construction Manager, will return annotated file.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. General: Provide one (1) electronic copy and one (1) paper copy of warranties.
 2. Bind warranties and bonds in heavy-duty, three-ring, white vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 3. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 5. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.9 PROJECT CLOSEOUT CHECK LIST

- A. Requirements: Contractor must provide the following prior to the Architect and Construction Manager approving the release of final payment:
 1. Verification that final punch list is complete.
 2. Final Affidavit.
 3. Consent of Surety.
 4. Final Lien Waiver.
 5. Affidavit of compliance with Prevailing Wage requirements.
 6. As-Built drawings applicable to this Contract.
 7. Operation and Maintenance Manuals applicable to this Contract.
 8. Current Insurance Certificate.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might

damage finished surfaces.

PART 3 EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. Remove snow and ice to provide safe access to building, as applicable.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority, as applicable, will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. General: Provide one (1) pdf electronic file and one (1) paper copy as follows:
 - a. PDF electronic file: Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - 1) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - 2) Enable inserted reviewer comments on draft submittals.
 - b. Paper copy: Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through Construction Manager, will transmit paper copy to Owner upon acceptance.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least thirty (30) days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and, as applicable, Commissioning Authority's comments. Submit copies of each corrected manual within ten (10) days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. General: Submit one (1) paper copy and one (1) copy in pdf electronic file format.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor and Installer (if applicable).
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority, as applicable.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, white vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Flood.
 4. Gas leak.
 5. Water leak.
 6. Power failure.
 7. Water outage.
 8. System, subsystem, or equipment failure.
 9. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.

- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. General: Final Payment will not be made until Project Record Documents are submitted to, reviewed by and are acceptable to the Architect.
- B. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one (1) paper-copy set of marked-up record prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- C. Record Specifications: Comply with the following:
 - 1. Initial Submittal:
 - a. Submit one paper-copy set(s) of marked-up record specifications.
 - b. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - 2. Final Submittal:
 - a. Submit PDF electronic files of scanned and marked-up record specifications.
- D. Record Product Data: Submit one (1) paper copy and one (1) annotated PDF electronic file and directory of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one (1) paper copy and one (1) annotated PDF electronic file and directory of each submittal.
- F. Reports: Submit written report weekly, indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one (1) set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files:
 - 1. Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 - a. Format: Annotated PDF electronic file with comment function enabled.
 - b. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - c. Refer instances of uncertainty to Architect through Construction Manager for resolution.
 - d. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - 1) See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
 - 2) Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.

3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Construction Manager.
 - e. Name of Architect.
 - f. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Refer to previous Article.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit one (1) copy of record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as one PDF electronic file and a separate paper copy of marked-up miscellaneous record submittals].
 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 017839 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Pre-Produced demonstration and training videos.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced (pre-produced) demonstration and training video recordings for systems, equipment, and products.
- B. Qualifications: For Instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.3 CLOSEOUT SUBMITTALS

- A. Pre-Produced Demonstration and Training Video Recordings: Submit two (2) copies within seven days of end of training.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Construction Manager.
 - d. Name of Contractor.
 - e. Date of video recording.
 - f. Name and address of videographer.
 - 2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 - 3. At completion of training, submit complete training manual(s) for Owner's use. One copy shall be prepared and bound in format matching operation and maintenance manuals, and the second copy shall be in PDF electronic file format on compact disc.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.

3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 4. Operations: Include the following, as applicable:
 - a. Startup and shutdown procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.

- h. Normal shutdown instructions.
- i. Operating procedures for emergencies.
- j. Operating procedures for system, subsystem, or equipment failure.
- k. Seasonal and weekend operating instructions.
- l. Required sequences for electric or electronic systems.
- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module.
Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Coordinate with Owner for number of participants, instruction times and location.
 - 2. Describe system design, operational requirements, criteria and regulatory requirements.
 - 3. Owner will furnish Contractor with names and positions of participants.
 - a. Owner will have in attendance a participant to describe Owner's operational philosophy.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Construction Manager, with at least seven (7) days' advance notice.
 - a. Notify Architect in writing of training schedule.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. Pre-Produced Video Recordings. Video recordings may be used as a component of each training module. Upon completion of training, furnish to Owner one (1) copy of each video used for training.

END OF SECTION 017900

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure as indicated, and as required to accommodate new construction.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 017300 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

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

1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building to ensure uninterrupted progress of Owner's on-site operations and of Owner's partial occupancy of completed Work.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.
 - 1. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
 - 1. Prior to commencement of demolition, representatives of the Owner and the Contractor will inspect the project areas where work will be conducted, and designate items to be salvaged. Items to be salvaged shall be identified by tagging/labeling and listed on the inventory.

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. Furniture, Fixtures, and Equipment.
 - b. Fine Arts Inventory.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before the start of Work.
 - a. Scheduling and phasing of hazardous materials removal shall be conducted prior to start of work in consultation with Contractor and Owner's forces. It may be necessary for portions of hazardous materials removal to occur after the start of construction. In such cases, areas where hazardous materials removal occurs shall be abandoned by Contractor during removal until hazardous materials removal is complete.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

3. Contractor and Owner's forces shall each conduct work according to all applicable OSHA and EPA regulations.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 2. 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 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary"

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
- C. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- D. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.
- E. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Locate temporary wall/knockout panels and remove to extent indicated, minimizing damage to existing adjacent construction to remain.
 10. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

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

- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.
- F. Wood Trim and Plaster: Carefully remove wood trim adjacent to interior plaster work to minimize damage to plaster work to remain. Remove loose plaster back to solid/sound plaster.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.7 CLEANING

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

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete (033000.A01), including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings and trench footings (grade beams).
 - 2. Slabs-on-grade.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012300 "Alternates" for alternates effecting work of this Section.
 - 3. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.2 DEFINITIONS

- A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
- B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, other pozzolans, and silica fume; materials subject to compliance with requirements.
- C. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.
- D. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.
- E. W/CM Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. 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. Architect and Engineer.
 - b. Contractor's superintendent.
 - c. Independent testing agency responsible for concrete design mixtures.
 - d. Owner's testing agency.
 - e. Ready-mix concrete manufacturer.
 - f. Concrete Subcontractor.
 - g. Flatwork technicians.
 - h. Manufacturer's representative for waterproofing admixture.
 - i. Flooring manufacturers.
 - 2. Review special inspection and testing and inspecting agency procedures for the following:
 - a. Field quality control.
 - b. Concrete finishes and finishing.
 - c. Cold- and hot-weather concreting procedures.
 - d. Curing procedures.
 - e. Construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers.
 - f. Forms and form removal limitations.
 - g. Vapor-retarder installation.
 - h. Anchor rod and anchorage device installation tolerances.
 - i. Steel reinforcement installation.

- j. Methods for achieving specified floor and slab flatness and levelness.
- k. Measurement of floor and slab flatness and levelness.
- l. Perimeter insulation installation.
- m. Waterproofing admixture.
- n. Concrete repair procedures.
- o. Concrete protection.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. 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. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - a. Batch delivery tickets shall indicate batch weights as well as amount of available water to add on each delivery ticket.
- C. 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.
- D. Jointing Layout: Submit floor plans indicating proposed layout and locations for joints required to construct the structure, including but not limited to the following:
 - 1. Location of expansion joints.
 - 2. Location of construction and control joints. Locations are subject to approval of the Architect.
- E. Samples: For each of the following materials:
 - 1. Form-facing panels.
 - 2. Form ties.
 - 3. Form liners.
 - 4. Chamfers and rustications.
 - 5. Waterstops.
 - 6. Vapor retarder.
- F. Quality Control Submittals for Underslab Composite Vapor Retarders:
 - 1. Submit current third party laboratory test results showing compliance with ASTM and ACI Standards.
 - 2. Submit manufacturer's product sample and literature.
 - 3. Submit manufacturer's installation instructions for placement, seaming and taping, and pipe penetrations taking into consideration existing soils conditions.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
- D. 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.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Include details of decorative formwork matching design shown on drawings.
- F. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

- G. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- H. Field quality-control reports.
- I. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. 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.
 - 1. Installer of concrete topping slabs indicated to receive polished concrete finish and structural cast-in-place concrete slab shall be same as installer for polished concrete finishes.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, 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.
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 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.
 - 1. Waterproofing (capillary break) admixture manufacturer will test new concrete slabs for permeability.
- H. Other Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. For each type of grind and finish level, pour and finish a separate slab-on-grade to be used for a field sample of the polished concrete. Size of field sample area shall not be less than 10 by 10 feet.
 - 2. Build panel approximately 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

- C. Protect foam plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.9 FIELD CONDITIONS

- A. 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.
- B. 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.

PART 2 PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.
 - 3. ACI 318.
 - 4. ACI 360.

2.2 FORM-FACING MATERIALS

- A. Form-Facing Panels for As-Cast Finishes: Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces, medium-density overlay, Class 1, or better, mill-applied release agent and edge sealed, complying with DOC PS 1.
- B. Smooth-Formed Finished Concrete (033000.A16): Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - 2. Metal, or other approved panel materials.
- C. 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.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum; nonstaining; in longest practicable lengths.

- G. Rustication Strips (033000.A05): Metal, dressed wood, or rigid plastic, or with sides beveled and back kerfed; nonstaining; fabricated to configurations indicated, in longest practicable lengths.
 - 1. Chamfer strips shall be 3/4 by 3/4 inch, minimum.
- H. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars (033000.A06): ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- D. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- E. Plain-Steel Welded-Wire Reinforcement (033000.A09): ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- F. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, 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, 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. Slab-on-grade supports: Provide supports specifically designed for bearing on soil.
 - 3. Where legs of wire bar supports contact forms, use CRSI Class 1, gray, plastic-protected bar supports.

2.5 CONCRETE MATERIALS

- A. Regional Materials: Concrete shall be manufactured within 100 miles (160 km) of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- C. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray.
 - 2. Blended Hydraulic Cement: ASTM C595/C595M, Type IL, portland-limestone cement.
 - 3. Fly Ash: ASTM C 618, Class C.
- D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S 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.

1. Maximum Coarse-Aggregate Size:
 - a. 1-inch nominal for slabs on grade and foundations.
 - b. 3/4-inch nominal for all other locations.
- E. Air-Entraining Admixture: ASTM C 260/C 260M.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 4. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- G. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
- H. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
- I. Waterproofing (Capillary Break) Admixture: Admixture shall be formulated to react with water and alkali in the concrete to fill the capillaries within the concrete with calcium silicate hydrate. Admixture shall also have plasticizing properties. Admixture shall be used in lieu of a portion of the mix water, not in addition to the mix water.
 1. Manufacturer's Warranty: Submit manufacturer's standard warranty executed by an authorized company official. Manufacturer's warranty is in addition to, and not a limitation of other rights Owner may have under provisions of the Contract Documents.
 - a. Warranty Period: Ten (10) years commencing on the date of acceptance of the Project by Owner or date of Substantial Completion, whichever is earliest.
 - b. Warranty Terms: Terms to include moisture related failures, including all finish floor materials and labor.
 2. Admixture Manufacturers and Products:
 - a. Concure Systems; Concure.
 - b. ISE Logik Industries; MVRA 900.
 - c. Specialty Products Group (SPG); VaporLock 20/20.
 - d. Barrier One International; Barrier One.
 3. Accessories materials:
 - a. Topical vapor sealer as necessary when results from moisture testing by waterproofing admixture manufacturer indicate moisture vapor emission and/or relative humidity with slab exceeding acceptable levels.
 4. Locations to receive Waterproofing Admixture:
 - a. New slabs-on-grade and elevated slabs.
 - b. Trenches within existing slabs-on-grade.
 - c. Use of waterproofing admixture at polished concrete shall be coordinated with concrete polisher prior to installation.
- J. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS (033000.A14)

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum perm rating of 0.01 US perms, a minimum puncture resistance of 2260 grams and a minimum tensile strength of 57 lbf/in. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Insulation Solutions, Inc.; Viper VaporCheck II, 15 mil, Class A.
 - b. Inteplast Group; Barrier-Bac VB-350, 16 mil.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Poly-America; Husky Yellow Guard, 15 mil.
 - e. Raven Industries Inc.; Vapor Block 15.
 - f. Stego Industries, LLC.; Stego Wrap Vapor Barrier 15 mil.

2.7 GRANULAR DRAINAGE/ CAPILLARY BREAK MATERIAL

- A. Granular Drainage Fill (033000.A15): Clean mixture of crushed stone or crushed or un-crushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.8 PERIMETER INSULATION

- A. Foam-Plastic Board Insulation (072100.A01): Provide one of the following:
1. Basis of Design: Subject to compliance with requirements provide extruded-polystyrene board insulation complying with ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - a. Type IV, 25 psi.
 2. Acceptable Alternate: Provide molded polystyrene board insulation complying with ASTM C 578.
 - a. Type IX, 25 psi.

2.9 LIQUID FLOOR TREATMENTS (033000.A21)

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces, while improving slip resistance.
1. Basis-of-Design Products: Subject to compliance with requirements, provide Curecrete Distribution Inc.; "Ashford Formula" or comparable product meeting specified performance requirements, submitted to and accepted by Architect prior to bidding.
 2. Performance Criteria:
 - a. Abrasion Resistance: Improves abrasion resistance by not less than 30 percent over untreated concrete when tested in accordance with ASTM C 779.
 - b. Coefficient of Friction: ASTM C 1028, on steel-troweled concrete samples versus tile, reduces slippage as follows:
 - 1) Dry: 0.71 untreated and with treatment not less than 0.86.
 - 2) Wet: 0.47 untreated and with treatment not less than 0.69.
 - c. Hardening: Improves hardness by not less than 35 percent over untreated concrete when tested in accordance with ASTM C 39 after 28 days.
 - d. Impact Resistance: Improves impact resistance by not less than 13 percent over untreated concrete when tested in accordance with ASTM C 805, rebound number.
 3. Basis-of-Design Products: Subject to compliance with requirements, provide Prosoco, Inc.; "Consolideck LS" or comparable product meeting specified performance requirements, submitted to and accepted by Architect prior to bidding.
 - a. Description: Clear premium sealer, hardener and densifier. This penetrating lithium silicate treatment reacts with the concrete to produce insoluble calcium silicate hydrate within the concrete pores. The treated surfaces resist damage from water and surface abrasion. The increased surface hardness reduces dusting and simplifies maintenance.
 - b. Performance Criteria:
 - 1) Form: Clear, colorless, odorless liquid.
 - 2) Specific Gravity: 1.10.
 - 3) pH: 11.0.
 - 4) Weight per Gallon: 9.2 pounds.
 - 5) Active Content: 14.5 percent.
 - 6) Total Solids: 14.5 percent.
 - 7) Flash Point: Not applicable.
 - 8) Freeze Point: 32 degrees Fahrenheit (0 degrees Celsius)
 - 9) Shelf Life: 2 years in unopened, factory-sealed container
 - 10) VOC Content: 0 grams per Liter. Complies with all known national, state and district AIM VOC regulations.
 4. 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."

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. Conspec by Dayton Superior; Aquafilm.
 - c. Dayton Superior Corporation; Sure Film (J-74).
 - d. Euclid Chemical Company (The), an RPM company; Eucobar.
 - e. L&M Construction Chemicals, Inc.; E-CON.
 - f. Meadows, W. R., Inc.; EVAPRE.
 - g. SpecChem, LLC; Spec Film
 - h. Unitex; PRO-FILM.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 - 1. For areas to receive decorative polished concrete, use membrane forming curing compound.
- C. Clear, Waterborne, Membrane-Forming Curing Compound (**Exterior Slabs Only**): ASTM C 309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Kure 200.
 - b. Conspec by Dayton Superior; W.B. Resin Cure.
 - c. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - d. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - e. L&M Construction Chemicals, Inc.; L&M Cure R.
 - f. Meadows, W. R., Inc.; 1100-CLEAR.
 - g. SpecChem, LLC; Spec Rez 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."
 - 3. For use in areas with exterior concrete flatwork not indicated within Civil Drawings.

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips (033000.A22): ASTM D 1751, asphalt-saturated cellulosic fiber or W. R. Meadows; "Deck-O-Foam". Thickness for expansion joint filler strip shall be ½ inch, unless otherwise indicated.
 - 1. For isolation joint filler strips, provide 30# asphalt saturated felt.
- B. Semi-rigid Joint Filler (033000.A23): Two-component, semi-rigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 85 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, 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, nonload bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. 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 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Basis of Design: Subject to compliance with requirements, Provide "Ultraplan 1 Plus" by MAPEI or a comparable product with the following characteristics .
 - 2. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 3. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 5. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, 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 5000 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: Use fly ash, as needed to reduce the total amount of portland cement, which would otherwise be used, by not more than 15 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 15 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
 - 5. Use waterproofing (capillary break) admixture in concrete mixtures for slabs on grade and trenching repair for existing slabs on grade.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Grade Beams: Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.51.
 - 3. Slump Limit: 4, plus or minus 1 inch.
 - 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
- B. Slabs-on-Grade (Exterior stoop slabs and stairs): Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.

3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- C. Slabs-on-Grade (Interior): Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), 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. (0.76 cu. m) 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. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 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.
 4. Waterproofing (Capillary Break) Admixture shall be added at the jobsite before discharge in accordance with admixture manufacturer's written instructions. The admixture manufacturer's representative shall be present at time of dosing admixture and initial concrete placement. Use for all concrete slabs on grade and elevated slabs.

PART 3 EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), 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 (ACI 117M).
1. Form recessed slabs as indicated.
- C. Utilize sides of trenches for forms whenever possible. Where sides of trenches cannot be used; design, erect, support and maintain formwork to support vertical, lateral, static and dynamic loads that might be applied until such loads can be supported by concrete structure.
- D. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- E. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - a. Fins shall be ground smooth with adjacent concrete surface.
 2. Class C, 1/2 inch for rough-formed finished surfaces.
- F. Construct forms tight enough to prevent loss of concrete mortar.

- G. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
 - 3. For concrete exposed-to-view on the building interior, seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
 - 4. Construct forms tight enough to prevent loss of concrete mortar.
- H. 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.
- I. 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.
- J. Chamfer exterior corners and edges of permanently exposed concrete.
- K. Ease edges of tread-to-riser transitions of concrete riser platforms of seating to dimension as indicated on the drawings.
- L. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
 - 1. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

3.2 EMBEDDED ITEM INSTALLATION

- 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 303.

3.3 PERIMETER INSULATION

- A. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- B. On vertical footing and foundation wall 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 below exterior grade line.

3.4 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing

and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support 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.
 3. Do not cut or puncture vapor retarder.
 4. Schedule form removal to maintain surface appearance that matches approved field sample panels and mockups.
 5. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.
- B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 GRANULAR DRAINAGE FILL

- A. Granular Drainage/Capillary Break Fill Course: Cover vapor retarder with not less than indicated depth of granular drainage fill material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 1/2 inch.
1. Compaction Requirements: Compact to within 95 percent maximum density in accordance with ASTM C 698, Standard Proctor compaction, at workable moisture content.
 2. At trenches through existing slabs on grade, provide at additional granular drainage fill/capillary break material to achieve a thickness of not less than 4 inches.
 3. Refer to Section 313200 "Subsoil Stabilization" for additional requirements regarding granular drainage fill.

3.7 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders for Slabs on Grade: Following leveling and tamping of granular drainage fill course for building slabs on grade, place vapor retarder sheet with longest dimension parallel with direction of pour. Place, protect, and repair sheet vapor retarder according to ASTM E 1643, manufacturer's written instructions and as follows:
1. Lap joints 6 inches and seal with manufacturers' recommended tape.
 2. Lap vapor retarder over and seal to footings, foundation, strip footings, grade beam and any edge of slab that terminates at existing building conditions, as occurs.
 3. Seal pipe penetrations with pipe boot made from vapor retarder material, seal with pressure sensitive tape and vapor retarder manufacturer's recommended mastic.
 4. Repair punctures and tears with patches of vapor retarder material, lapping 6 inches on all sides and sealing with pressure sensitive tape.
- B. Sheet Vapor Retarders at Trenches in Existing Slabs on Grade: At trenches through existing slabs on grade, place vapor retarder over granular drainage fill/capillary break material and bring up tight to sides of opening to receive concrete. Extend vapor retarder up sides 2 inches and seal with asphaltic mastic. Lap joints 6 inches and

seal with vapor retarder manufacturer's recommended mastic or pressure sensitive tape. Repair tears and punctures with patches of vapor retarder material lapping 6 inches on all sides of puncture/tear and seal with mastic of pressure sensitive tape. Seal all penetrations.

3.8 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor 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 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.

3.9 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 beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls at 100 feet maximum. 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.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 8. At Load Transfer Joints: Provide one of the following:
 - a. 2 by 4 inch continuous keyway.
 - b. One #4 by 12 inch long smooth dowel.
 - c. Diamond dowel system.
- 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. 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 does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - a. Where joints are not specifically indicated, space joints at 15 feet on center (area not to exceed 225 sq ft.). For polished concrete, space joints at 10 feet on center (area not to exceed 100 sq ft.).
 - b. Begin saw cutting of joint no later than 12 hours after finishing.
- 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. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are 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 079200 "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.

3.10 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless water was withheld at batch plant, amount withheld was documented in writing and adding withheld water is acceptable to Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
 - a. Refer to ACI 303.1 for areas to receive architectural concrete finishes.
 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 (150 mm) 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.
 - a. Do not permit vibrators to contact forms.
- 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. Concrete slab repairs at trenches shall be flush with adjacent concrete surface.
 6. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. 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.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.11 FINISHING FORMED SURFACES

- A. 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 (033000.A16): 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. For concrete exposed to view on the interior of the building, fins and other projections shall be removed flush with adjacent surface of concrete.
 - 2. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish (033000.A17): 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.
 - a. Apply to concrete surfaces exposed to public view on vertical surfaces of sides of ramps, at sides of stairs and at lightpole bases.
- 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.

3.12 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, 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. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, and built-up or membrane roofing.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten 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 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. Do not burnish concrete.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; 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 slab repairs at trenches to be flush with adjacent concrete surfaces.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset 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 (033000.A18): Apply a broom finish to traffic surfaces of 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.

3.13 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- 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:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 3500 psi (24.1 MPa) at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.14 CONCRETE PROTECTING AND CURING

- A. General:
 - 1. 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 (ACI 301M) for hot-weather protection during curing.
 - 2. Contractor shall be responsible for providing exposed finishes completely free of graffiti, scratches, and other man-made marks made after wet concrete has been placed. Marked surfaces shall be removed and replaced at no additional cost to Owner.
- 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 (1 kg/sq. m 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 remainder of 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, as follows:
 - 1. 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. Use moisture-retaining covers to cure concrete slab surfaces to receive all types of floor coverings.
 - b. Use moisture-retaining covers to cure concrete slab surfaces to receive penetrating liquid floor treatments, sealed concrete floor treatments and decorative polished concrete floor treatment.
 - 2. 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.

3.15 LIQUID FLOOR TREATMENT APPLICATION

- 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.

3.16 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 four month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid 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.
 - 1. Where control/contraction joints extend to the exterior of the building, beyond aluminum storefront, curtain wall and similar framing, completely fill joints with semi-rigid joint filler from exterior to inside face of framing. Exposed joint shall be completely filled and made water-tight.
 - 2. Where control/contraction joints occur in floors indicated to receive penetrating sealed concrete finish.

3.17 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) 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 (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). 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 matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 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, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) 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 (6 mm) 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 (25 mm) 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 (19-mm) 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 (25 mm) 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.

3.18 FIELD QUALITY CONTROL

- A. Special Inspections and Testing: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Waterproofing (capillary break) admixture manufacturer shall test new concrete slabs for permeability.
- C. 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.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
 8. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides 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/C 143M; 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/C 231M, 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/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M.
 - 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.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. 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.
 7. 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.
 8. 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 (3.4 MPa).
 9. 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.
 10. 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.
 11. 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.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. 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 (ASTM E 1155M) within 72 hours of initial concrete placement.

3.19 PROTECTION OF FLOOR TREATMENTS

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

END OF SECTION

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SECTION 040100 - MASONRY RESTORATION AND CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of masonry restoration work is indicated on drawings and as specified hereinafter.
- B. This Section includes, but is not limited to, the following masonry restoration and cleaning.
 - 1. Replace or repair damaged or missing CMU and Brick.
 - 2. Mortar filling of all voids in brick joints to about 3/4" from surface of brick.
- C. Related Requirements:
 - 1. Section 079200 "Joint Sealants".

1.2 DEFINITION

- A. Repointing: The process of raking out (removing) mortar and replacing it with new mortar.

1.3 QUALITY ASSURANCE

- A. Restoration Specialist: The repair and pointing shall be carried out by a firm having not less than seven (7) years successful experience under the current company name, in the cleaning, repair, joint raking and pointing of masonry similar to the work described in this Section.
 - 1. The Contractor shall submit all the following information demonstrating the masonry Contractor's qualifications and experience with the Bid for approval by the Architect and Owner. Contractors not submitting the required information or failing to meet the minimum requirements will be disqualified and will not be allowed to perform the work of this Section.
 - a. Provide written description of a minimum of three projects completed within the past five years for which the masonry Contractor has performed the masonry cleaning, pointing and repair. Projects must have been performed on properties 50 years old or older. Provide the name and address of the Project, the name and telephone number of the Owner and Architect, dates work was performed, and a description of the materials and methods used to perform the work for each project.
 - b. Submit a resume for each of the persons who will be supervising and performing the work of this Section demonstrating a minimum of three (3) years experience working in their trades, list of three example projects describing the work the person has performed. Example projects can be the same or different than the example projects described for the said masonry Contractor described above. Only individuals whose resumes have been submitted, reviewed and accepted will be allowed to perform the work of this Section.
 - c. The masonry Contractor's qualifications submittals shall be completed by the masonry Contractor and shall be signed by an authorized official of the firm and dated.
- B. Source of Material: Obtain materials for masonry restoration from a single source for each type material required to ensure match of quality, color, pattern, and texture.
- C. Owner Representative and/or Architect may randomly selected areas of tuckpointing to be raked for verification of the appropriate depth of pointing and void filling. Contractor shall bear the cost of repointing these areas of selected destructive testing in their base bid.
- D. Preconstruction Conference: Approximately two weeks prior to scheduled commencement of work of this Section, the General Contractor shall meet at Project site with Architect, Owner's Representative, masonry restoration Contractor, and each Subcontractor and other representatives directly concerned with performance of the work of this Section. General Contractor to record discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending.

1.4 SUBMITTALS

- A. **Product Data:** Submit manufacturer's technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.
- B. **Samples:** Submit, for verification purposes, prior to mock-up erection, samples of the following:
 - 1. For replacement face bricks provide straps or panels containing not less than 8 units and representing the entire color range.
- C. **Patching Mortar:** Submit the following items in time to prevent delay of the work and to allow adequate time for review and resubmittal, if needed; do not order materials or start work before receiving the written approval:
 - 1. Written certificates from the repair mortar manufacturer shall be submitted stating that all installers of the repair mortar have successfully completed the training workshop for installation of the mortar.
 - 2. Samples of all specified materials and Material Safety Data Sheets (MSDS) as appropriate.
 - 3. Certificates, except where the material is labeled with such certification, by the producers of the materials, that all materials supplied comply with all the requirements of these specifications and the appropriate standards.
 - 4. Color-match patch samples fabricated on pieces of appropriate masonry from or on the building using the specified repair mortar as required.
 - 5. Written verification that all specified items will be used. Provide purchase orders, shipping tickets, receipts, etc., to prove that the specified materials were ordered and received.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Carefully pack, handle, and ship masonry units and accessories strapped together in suitable packs or pallets or in heavy cartons. Unload and handle to prevent chipping and breakage.
- B. Deliver other materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
- C. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.
- D. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

1.6 PROJECT CONDITIONS

- A. Clean masonry surfaces only when air temperatures are 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but for not less than 7 days after completion of cleaning.
- B. Do not repoint mortar joints or repair masonry unless air temperatures are between 40 deg F (4 deg C) and 80 deg F (27 deg C) and will remain so for at least 48 hours after completion of work.
- C. Prevent grout or mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Remove immediately grout and mortar in contact with exposed masonry and other surfaces.
- D. Protect sills, ledges and projections from mortar droppings.
- E. Do not apply water repellent treatments to wet surfaces or during rain or when there is a chance of rain within 24 hours after application without protection which will prevent wetting.
- F. Do not apply water repellent materials when winds are sufficient to carry airborne chemicals to unprotected surfaces.
- G. Provide protection and facilities necessary to maintain progress within schedule.

1.7 SEQUENCING AND SCHEDULING

- A. Perform masonry restoration work in the following sequence:
 - 1. Repair existing masonry including replacing existing masonry with new masonry materials.
 - 2. Rake out existing mortar from joints indicated to be repointed.
 - 3. Repoint existing mortar joints of masonry indicated to be restored.
 - 4. Clean existing masonry surfaces.
 - 5. Sealants work by others must be completed.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. CMU, Face Brick and Accessories: Provide CMU, face brick and accessories, including units for lintels, arches, corners, and other special ground, cut, or sawed shapes where required to complete masonry restoration work.
 - 1. Provide units with color, surface texture and size to match existing brick work and with physical properties not less than those determined from preconstruction testing, of selected existing units.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. For stonework and other masonry indicated, provide non staining white or gray cement complying with staining requirement of ASTM C 91 for not more than 0.03% water soluble alkali.
 - a. Intent is to match color.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: No. 1 Brick Sand (fine sand), free of loam, silt and organic matter.
 - 1. Match size, texture and gradation of existing mortar as closely as possible.
- D. Colored Mortar Pigment: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.
- E. Water: Clean, free of oils, acids, alkalis and organic matter.

2.3 CLEANING MATERIALS AND EQUIPMENT

- A. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.
- B. Warm Water: Heat water to temperature of 140 deg F 180 deg F (60 deg C 82 deg C).
- C. Brushes: Fiber bristle only.
- D. Brick Cleaner: Manufacturer's acidic masonry restoration cleaner composed of hydrofluoric acid blended with other acids including trace of phosphoric acid and combined with special wetting systems and inhibitors.
 - 1. Product: Subject to compliance with requirements, provide one of the following:
 - a. Sure Klean T-785 Heavy Duty Restoration Cleaner:, ProSoCo, Inc.
 - b. Diedrich Chemicals.
- E. Concrete Cleaner:
 - 1. Product: Subject to compliance with requirements, provide Sure Klean Light Duty Concrete Cleaner by ProSoCo, Inc. or a comparable product submitted to and accepted by Architect prior to bidding.
- F. Protective Film: For windows, glass, metal and polished stone surfaces during acidic and alkaline masonry cleaning, use self-adhesive, translucent polyethylene protective film.
 - 1. Products: 3M Long-mask Masking Tape #2090 and the self-adhesive, thin, window protection film by 3M, 3M Protective Tape 2A26B. Catalog No. RM2090, 24" or 35" side.

- G. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume.
 - 1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.
 - 2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 45 degrees.

2.4 MORTAR MIXES

- A. Existing mortar to be analyzed by Owner's Testing Laboratory as a part of this Contract to establish existing mix, presence of portland and compressive strength. New mortar to have no more portland content than original.
- B. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure. Mix materials in a clean mechanical batch mixer.
- C. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- D. Mortar proportions:
 - 1. Pointing mortar for brick: One part gray portland cement, three parts lime and eight to twelve parts natural mortar aggregate.
 - 2. Rebuilding mortar shall be the same as pointing mortar.
 - 3. Intent is for cured mortar to match color, texture and not exceed compressive strength of original mortar.

2.5 CHEMICAL CLEANING SOLUTIONS

- A. General: Unless otherwise indicated, dilute chemical cleaning materials with water to produce solutions of concentration indicated but not greater than that recommended by chemical cleaner manufacturer.
- B. Acidic Cleaner Solution for Brick: Diluted with four parts water to one part cleaning solution.
- C. Chemical Paint Remover: In concentration recommended by chemical cleaner manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products.
- B. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, building site, and surrounding buildings from injury resulting from masonry restoration work.
 - 1. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces which could be injured by such contact.
 - 2. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
 - 3. Dispose of run off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
 - 4. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.
- C. Protect glass, unpainted metal trim and polished stone from contact with acidic chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.
- D. Protect unpainted metal from contact with alkali chemical cleaners and water repellent by covering them either with liquid strippable masking agent or polyethylene film and waterproof masking tape.

- E. Containment of all runoff related to cleaning masonry will be a must in order to minimize impact on surrounding vegetation; Contractor is responsible to meet all local, state and federal regulations in each masonry cleaners' application, handling, and disposal. ProSoCo indicates that containment and proper disposal of Sure Klean 509 paint stripper is without exception always regulated due to the petroleum base products it contains.

3.2 CLEANING EXISTING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Use only those cleaning methods indicated for each masonry material and location.
- C. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.
- D. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.
- E. Water Application Methods: Spray Applications: Spray apply water to masonry surfaces to comply with requirements indicated for location, purpose, water temperature, pressure, volume and equipment. Unless otherwise indicated, hold spray nozzle not less than 6" from surface of masonry and apply water from side to side in overlapping bands to produce uniform coverage and an even effect.
 - 1. Low Pressure Spray: 100 400 psi; 3 6 gallons per minute.
 - 2. Medium Pressure Spray: 400 800 psi; 3 6 gallons per minute (only upon approval of Architect).
 - 3. Steam Wash: Apply steam to masonry surfaces at pressures not exceeding 80 psi. Hold nozzle no less than 6" from surface of masonry and apply steam from side to side or in direction of tooling in overlapping bands to produce uniform coverage and an even effect.
- F. Chemical Cleaner Application Methods: Use only when directed by Architect, after performing water only cleaning methods described above.
 - 1. General: Apply chemical cleaners to masonry surfaces to comply with chemical manufacturer's recommendations using brush or spray application methods, at Contractor's option, unless otherwise indicated. Do not allow chemicals to remain on surface for periods longer than that indicated or recommended by manufacturer.
 - 2. Spray Application: Apply to pressures not exceeding 50 psi, unless otherwise indicated.
 - 3. Reapplication of Chemical Cleaners: Do not apply chemical cleaners to same masonry surfaces more than twice.

3.3 CLEANING BRICKWORK

- A. Cold Water Wash: At locations indicated, clean brick masonry surface with cold water applied as follows:
 - 1. Low pressure spray.
 - 2. Medium pressure spray.
- B. Warm Water Wash: At locations indicated, clean brick masonry surfaces with warm water applied as follows:
 - 1. Low pressure spray.
 - 2. Medium pressure spray.
- C. Chemical Cleaning: At locations indicated, clean brick masonry surfaces with acidic cleaner applied as follows:
 - 1. Prewet masonry with cold water applied by low pressure spray.
 - 2. Prewet masonry with warm water applied by low pressure spray.
 - 3. Apply acidic cleaner to masonry. Let cleaner remain on surface for period indicated below before rinsing away:
 - a. As recommended by chemical cleaner manufacturer.
 - b. 2 to 3 minutes.
 - 4. Rinse masonry with cold water to remove chemicals and soil, applied by medium pressure spray.
 - 5. Repeat chemical cleaning procedure above where required to produce effect established by mock-up. Do not apply more than twice.
 - 6. Do not clean brick work prior to seven (7) days after completion of the tuckpointing.

3.4 BRICK AND CMU REMOVAL AND REBUILDING

A. Brick and CMU Removal

1. Locations of brick and CMU removal are shown on the drawings and include the following:
 - a. Bricks and CMU displaced out from original face of masonry around the windows and as shown on the drawings.
 - b. Damaged brick or CMU to be replaced as shown on the drawings and as required.
2. Carefully remove by hand at locations indicated any brick which are damaged, spalled or deteriorated. Cut out full units from joint to joint and in manner to permit replacement with full size units. Small hand power saw (3-4" diameter) with 1/8" thick diamond blade only could be used for bed joints. Cut out head joints by hand with chisel and mallet only.
3. Support and protect masonry indicated to remain which surrounds removal area.
4. Salvage as many whole, undamaged bricks as possible.
5. Remove mortar, loose particles and soil from salvaged brick by cleaning with brushes and water. Store brick for reuse.
6. Clean remaining brick at edges of removal areas by removing mortar, dust, and loose debris in preparation for rebuilding.
7. Repair any damaged flashing to make watertight.

B. Brick Rebuilding

1. Install new or salvaged brick to replace removed brick. Fit replacement units into bonding and coursing pattern of existing brick. If cutting is required use mortar driven saw designed to cut masonry with clean, sharp unchipped edges.
2. Lay replacement brick with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet clay brick which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure that units are nearly saturated but surface dry when laid. Maintain joint width for replacement units to match existing.
3. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
4. Repoint new mortar joints in repaired area to comply with requirements for repointing existing masonry, except rake out joints before mortar sets.

3.5 REPOINTING EXISTING MASONRY

A. Joint Raking:

1. Rake out mortar from joints to depths equal to 2 1/2 times their widths but not less than 1" nor less than that required to expose sound, unweathered mortar.
2. Remove mortar from masonry surfaces within raked out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replacement of masonry units which become damaged.
 - a. Cut out old mortar by hand with chisel and mallet, unless otherwise indicated.
 - b. For bed joints a small power operated rotary hand saw with 1/8" thick, 3" to 4" diameter diamond blade will be permitted but only on specific written approval of Architect based on submission by Contractor of a satisfactory quality control program and demonstrated ability of operators to use tools without damage to masonry.

B. Joint Pointing:

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.
2. Fill the voids with pointing mortar in layers. Compact each layer and allow it to become thumbprint hard before applying the next layer. Fill the voids to about 1" from exposed face of bricks. Fill remaining 1" depth simultaneously with final pointing of entire brick facades.
3. After joints have been filled to a uniform depth, place remaining pointing mortar in 2 layers with each of first and second layers filling approximately half of the overall depth. First layer shall have a raked square edge. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have rounded edges recess final layer slightly from face. Take care not to spread mortar over edges onto exposed masonry surfaces, or to featheredge mortar.

4. When mortar is thumbprint hard, tool joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in a damp condition for not less than 72 hours. Provide temporary protection in areas exposed to direct sun.
6. Where repointing work precedes cleaning of existing masonry hallow mortar to harden not less than seven (7) days before beginning cleaning work.

3.6 FINAL CLEANING

- A. After mortar has fully hardened thoroughly clean exposed masonry surfaces of excess mortar and foreign matter using stiff nylon or bristle brushes and clean water, spray applied at low pressure.
- B. Use of metal scrapers or brushes will not be permitted.
- C. Use of acid or alkali cleaning agents will not be permitted.
- D. Remove and dispose of waste, debris and masking materials following completion of consolidation operation. Leave surfaces and adjacent areas clean.
- E. Sweep and flush residue washed from building surface away from surrounding sidewalk and service areas nightly. Maintain premises clean and neat at all times.

END OF SECTION 040100

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SECTION 042000 - UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units (042000.A01).
2. Clay face brick (042000.A12).
3. Structural Clay Masonry Unit
4. Lintels and Bond Beams
 - a. U-Shaped Masonry Lintels (042000.A10).
 - b. Knock-Out Masonry Bond Beam (042000.A11).
5. Mortar (042000.A19)
6. Grout (042000.A22).
7. Reinforcement
 - a. Steel reinforcing bars (042000.A23).
 - b. Masonry-joint reinforcement (042000.A24).
 - c. Ties and anchors.
 - d. Adjustable Masonry Veneer Anchors (042000.A26).
 - e. Rigid Anchors (042000.A27).
8. Masonry flashing materials:
 - a. Embedded Metal Flashing (042000.A30).
 - b. Drip Edge (042000.A31).
 - c. Embedded flexible through-wall flashing (042000.A32).
 - d. Single wythe CMU flashing system (042000.A33).
 - e. Termination Bars (042000.A34).
 - f. Isolation strip flashing (042000.A42).
9. Miscellaneous masonry accessories.
 - a. Compressible filler (042000.A35).
 - b. Tubular compressible filler (042000.A36).
 - c. Wicking Material/Rope Weeps (042000.A38).
 - d. Weep Vents (042000.A39).
 - e. Cavity drainage material (042000.A40).
 - f. Cavity wall insulation (042000.A45).
 - g. CMU control joint (042000.A46).
10. Foamed-in-place masonry-cell fill insulation (042000.A44).

B. Products Installed but not Furnished under This Section:

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

C. Related Requirements:

1. Section 012200 "Unit Prices" for unit prices relating to work of this Section
2. Section 012300 "Alternates" for alternates effecting work of this Section.
3. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
4. Section 024119 "Selective Demolition" for salvaged brick.
5. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
6. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
7. Section 072100 "Thermal Insulation" for cavity wall insulation.
8. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before installation of unit masonry, review procedures and tolerances for ensuring quality of masonry materials. Require representatives of each entity directly concerned with unit masonry to attend, including but not limited to the following:
 - a. Owner's representative
 - b. Architect and Engineer.
 - c. Contractor's superintendent.
 - d. Masonry subcontractor.
 - e. Manufacturer's representative for masonry units.
 - f. Manufacturer's representative for flashing components.
 - g. Manufacturer's representative for moisture barrier system.
 - h. Manufacturer's representative for fluid applied air barrier system.
 - 2. Review field quality control measures for the following items:
 - a. Field dimensions and tolerances for unit masonry installation.
 - b. Installation procedures for flashing components.
 - c. Review of shop drawing elevations indicating colors of unit masonry and locations.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Submit product data for cavity wall insulation concurrently with product data for cavity wall insulation air barrier coatings.
- 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 Initial Selection:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Weep holes and cavity vents.
- D. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Special shapes for the following:
 - a. Clay face brick.
 - b. Concrete masonry units.
 - 3. Adjustable veneer anchors.
 - 4. Flexible through wall flashing.
 - 5. Weep holes and cavity vents.
 - 6. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of

aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Installer Qualifications for Foamed-in-Place Masonry Cell Fill Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.
- D. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For exposed brick, include test report for efflorescence according to ASTM C 67, including testing for Initial Rate of Absorption (IRA).
 - c. For concrete masonry units, include data and calculations establishing average net-area compressive strength of units.
 - d. For concrete masonry units included within fire resistant construction, provide certificate from manufacturer indicating compliance with ACI 216.1, latest edition for production of fire rated concrete masonry products.
 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.
 9. Flexible flashing: Include independent testing to verify the 8 mil and 32 mil requirements.
- E. 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.
- F. 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.
- G. Grout Procedures: Detailed description of methods, materials, and equipment to be used to comply with grouting requirements.
- H. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Mockups for Interior Walls: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups for typical interior wall areas indicated on Drawings.
 2. Protect accepted mockups from the elements with weather-resistant membrane.
 3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

4. Subject to compliance with requirements, approved field sample(s) may become part of the completed Work.
- C. Mockups for Exterior Walls: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups for typical exterior wall areas indicated on Drawings. Mockup shall be built to dimensions as indicated on Drawings and shall include the following features.
 - a. Some areas shall utilize masonry block backup. Some areas shall utilize stud backup. Refer to Drawings for sizes and locations.
 - b. In approximately the center of each leg of mockup shall be a 3/8 inch wide sealant-filled control joint. All backup substrates shall receive fluid-applied air barrier coating.
 - c. Include fixed aluminum window openings in dimensions and locations indicated on Drawings. Include window glazing and all accessories. Seal perimeter of window at head, sill and one jamb, leaving one jamb open for observation.
 - d. Include through-wall flashing installed for full length of all legs of mockup.
 - e. Include cavity insulation, veneer anchors, flashing, cavity drainage material, and weep holes and rope weeps (as applicable) in exterior masonry-veneer wall mockup.
 2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 3. Protect accepted mockups from the elements with weather-resistant membrane.
 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 5. Demolish and legally dispose of mockup after date established for Substantial Completion.
 6. Mockup shall be tested under AAMA 501.2 (Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.)

1.7 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. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 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 down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602-16.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F 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 402/602-16.

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 structural 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 402/602-16.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 402/602-16, 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 as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed by a qualified testing agency acceptable to authorities having jurisdiction. Documentation of listing and sourcing shall be provided by manufacturer to Owner and Architect.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners unless otherwise indicated.
 - a. At areas indicated to receive tile as the finish surface use a non-bullnose unit at outside corners.
 - 3. Provide double bullnose units for tops of walls as indicated.
- B. CMUs (042000.A01): ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2650 psi.
 - 2. Density Classification: Lightweight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

4. Fire Resistance: Concrete masonry units within fire rated wall construction shall be produced in accordance with ACI 216.1, latest edition.

2.5 MASONRY LINTELS AND BOND BEAMS

- A. U-Shaped Masonry Lintels (042000.A10): Prefabricated (site cast) or built-in-place masonry lintels made from U-shaped lintel CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- B. Knock-Out Masonry Bond Beams (042000.A11): Prefabricated (site cast) or built-in-place masonry bond beams made from U-shaped bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout.

2.6 BRICK

- A. 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.
- B. Face Brick (042000.A12): 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 as follows:
 - a. Match existing compressive strength of existing installed adjacent brick as determined by Architect and Contractor, verified by manufacturer and Contractor's field testing data.
 4. Initial Rate of Absorption:
 - a. Match existing initial rate of absorption of existing installed adjacent brick as determined by Architect and Contractor, verified by manufacturer and Contractor's field testing data.
 5. Saturation Coefficient:
 - a. Match existing saturation coefficient of existing installed adjacent brick as determined by Architect and Contractor, verified by manufacturer and Contractor's field testing data.
 6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 7. Size (Actual Dimensions):
 - a. Match existing brick at project site as determined by Architect and Owner.
 8. Application: Use where brick is exposed unless otherwise indicated.
 9. Color and Texture: Match Architect's samples.
 - a. Match existing brick at project site as determined by Architect and Owner.
- C. Salvaged Brick:
 1. General: Salvage and clean brick from deconstructed areas to provide replacement units.
 2. Salvaged Units:
 - a. Clean units removed during selective demolition areas
 - b. Clean off residual mortar.
 3. Priorities:
 - a. Address repairs near entrances.
 - b. Address repairs below low roofs.

2.7 STRUCTURAL CLAY MASONRY UNITS (042000.A14)

- A. 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.

B. Basis of Design:

1. Products: Subject to compliance with requirements, provide the following:
 - a. Provide Interstate Brick "Atlas," Hollow Core Brick.
2. Grade: SW.
3. Type: HBX.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as follows:
 - a. 9000 psi.
5. Initial Rate of Absorption:
 - a. Minimum: 6g/min/30 sq. in. when tested according to ASTM C 67.
 - b. Maximum: 30 g/min/30 sq. in. when tested according to ASTM C 67 (pre-wetting brick is recommended).
6. Saturation Coefficient:
 - a. Maximum 0.78 when tested according to ASTM C 67.
7. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
8. Size (Actual Dimensions):
 - a. Atlas - 7-5/8 inches wide x 3-5/8 inches high x 15-5/8 inches long.
 - b. Match existing brick at project site as determined by Architect and Owner.
9. Color and Texture:
 - a. As indicated on Drawings. Intent is to Match Existing.

2.8 MORTAR (042000.A19) AND GROUT (042000.A22) MATERIALS

- A. Regional Materials: Aggregate for mortar and grout shall be 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. 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 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.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
 2. Color:
 - a. As selected by Architect from manufacturer's full range of available colors.
 3. Location: Refer to Mortar and Grout Mixes in Part 3 of this Section.
- F. 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. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.

- H. 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.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ACM Chemistries; RainBloc for Mortar
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. – Conn; Dry-Block Mortar Admixture
- J. Water: Potable.

2.9 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars (042000.A23): ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- 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 steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: (Basis-of-Design) Subject to compliance with requirements, provide the following or submit for approved equal:
 - a. Single Bar (per cell): Hohmann & Barnard, Inc.: RB-815.
- C. Masonry-Joint Reinforcement, General (042000.A24): ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel, Class B-2.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel, Class B-2.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:
 - 1. Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
 - a. At Contractor's option, masonry joint reinforcement for single-wythe masonry may be used in backup wythe in conjunction with individual adjustable masonry veneer anchors for exterior wythe.

2.10 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch 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. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized steel wire, Class B-2.

- D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Use adjustable masonry veneer anchors specified later in this Section.
- E. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches 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.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- G. Adjustable Masonry-Veneer Anchors (042000.A26):
 - 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
 - 2. Provide anchors designed for attachment over sheathing to metal studs and other substrates indicated.
 - 3. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.
 - 4. Wire Ties: Fabricate ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 - a. Wire ties shall be triangular-, or rectangular-shaped.
 - 5. Masonry-Veneer Anchors - Contractor's Option: Unless otherwise indicated, provide one of the adjustable masonry-veneer anchors specified.
 - a. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie, a metal anchor section and insulation support plate. Provide one of the following anchor sections for masonry backup and metal stud with sheathing:
 - 1) Provide "CTP-16" adjustable masonry veneer anchors with insulation support plate as manufactured by Construction Tie Products, Inc.
 - 2) Provide "Slotted Rap-Tie" masonry veneer anchors with insulation support plate as manufactured by FERRO Corporation.
 - b. Fabricate sheet metal anchors sections and other sheet metal parts from 0.075 inch thick, steel sheet, galvanized after fabrication.
 - 6. At Interior CMU Veneer Anchored to Steel Studs: Subject to compliance with requirements, provide "DW-10" by Hohmann & Barnard or a comparable product submitted to and accepted by Architect.
 - 7. At Stack Bond Pattern for Masonry Veneer: Single screw anchor designed to penetrate and seal and secure insulation to backup, with 3/16 dia. hot-dip galvanized or stainless steel adjustable swaged, overlapping wire legs designed to engage a single continuous horizontal wire reinforcement. Anchor shall include stainless steel barrel with coated carbon steel screw. Barrel length shall match insulation length. Provide the following or a comparable product acceptable to Architect.
 - a. Basis-of-Design Product: "Thermal 2-Seal Tie" and "Thermal Concrete 2-Seal" as manufactured by Hohmann & Barnard, Inc.
 - 8. At Horizontal Running Bond Pattern for Stone: Provide product listed below or comparable product from another manufacturer.
 - a. Basis of Design Product: "2401 RJ-711 Adjustable Veneer Anchor" by Wire-Bond.
 - b. Anchor shall be equipped with a hook and 9 gauge straight seismic wire.
 - 9. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.
 - 10. Steel Tapping Screws for Concrete and Masonry: Self-tapping screws tapcon with specially designed threads for tapping and wedging into masonry, with hex washer head and neoprene washer, 3/16" diameter by 1-1/2" length, and with the following corrosion-protective coating:
 - a. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.

2.11 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

- B. Anchor Bolts: L-shaped steel bolts complying with ASTM A307, Grade A (ASTM 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and , where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- C. Postinstalled Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5 unless otherwise indicated.
 - 3. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F738M) and nuts, ASTM F594 (ASTM F836M).
- D. Stainless Steel Dowels: ASTM A 276 or ASTM A666, Type 304, 1/2 inch diameter and not less than 5 inches long to provide at least 2 inch embedment in to adjoining units/substrates.

2.12 EMBEDDED FLASHING MATERIALS

- A. Embedded Metal Flashing (042000.A30):
 - 1. Stainless Steel: ASTM A 240/A 240M, Type 304:
 - a. 26 gage for backing plate at butt laps.
 - b. 22 gage for receiver flashing and metal sealant stop.
 - 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet.
 - 3. Adhesive to adhere stainless steel flashing to top of lintel or substrate.
 - 4. Silicone sealant between stainless steel flashing at butt-laps.
- B. Flexible Flashing (042000.A32):
 - 1. Rubberized Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive.
 - a. Composite Sheet: Flashing shall be 40 mils in nominal thickness, consisting of 32 mil self-adhering rubberized asphalt membrane laminated to an 8 mil, cross-laminated and high-density polyethylene film.
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide one of the products listed below or comparable product from other manufacturers, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
 - 1) Acceptable Manufacturers and Products:
 - (a) Carlisle Coatings and Waterproofing; CCW-705-TWF.
 - (b) Grace Construction; Perm-A-Barrier Wall Flashing.
 - 2) Fire Propagation Characteristics: Flexible strip flashing is used in exterior walls
 - 3) Flexible flashing shall pass NFPA 285 testing as part of an approved assembly. Flashing shall be compatible with air barrier coating specified in Section 072729.
 - c. 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. For through-wall flashing, use flexible flashing to exterior face of exterior wythe, adhere flexible flashing to top of metal drip edge. Adhere stainless steel drip edges to masonry, steel lintels and adjacent construction beneath drip edge as occurs.
- D. Single-Wythe CMU Flashing System (042000.A33): System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.
 - 1. Products: Subject to compliance with requirements, provide the following or comparable product submitted to and accepted by Architect prior to bidding:
 - a. Mortar Net USA, Ltd; Blok-Flash.
- E. Accessories for Flexible Flashing:
 - 1. Drip Edges (042000.A31): Provide stainless steel drip edges fabricated from ASTM A 240/A 240M, Type 304, not less than 0.016 inch thick. Fabricate drip edges with a 2-1/2 inch minimum flange and a 3/8 inch drip. All exposed corners shall be welded and the edge rounded. Miterring of outside corners will not be accepted.

- a. Termination Drip Edges at Steel Lintels and Shelf Angles: Provide stainless steel drip edges fabricated to configuration indicated from ASTM A 240/A 240M, Type 304, not less than 0.016 inch thick. Stainless steel flashing shall be preformed to wrap around exposed portion of steel lintels and shelf angles and provide a drip edge.
 - 2. Termination Bars (042000.A34): Provide stainless steel or aluminum bars; 1/8 inch thick with a 1 inch face and 1/4 inch minimum bent top (lip) to receive sealant and 8'-0" to 10'-0" length. Bars shall be predrilled at 8 inch centers starting 4 inch from each end.
 - a. Termination bars shall be similar to Wire-Bond, Model 4210.
 - 3. Adhesives: Provide adhesives as recommended by flexible flashing manufacturer for adhering flexible flashing to drip edge and adhering drip edge to supporting substrate.
- F. Solder and Sealants for Sheet Metal Flashings:
- 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Elastomeric Sealant: ASTM C 920, chemically curing urethane or polysulfide sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- G. 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.
- H. Moisture Barrier:
- 1. Refer to Section 071326 "Self Adhered Sheet Waterproofing" for additional moisture barrier system product and installation requirements.

2.13 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler (042000.A35): Premolded filler strips, compressible up to 50 percent; of width and thickness indicated; formulated from neoprene or urethane.
- 1. Synthetic Foam complying with ASTM D 5249, Type 2; of width and thickness indicated.
 - a. Basis of Design Product: W.R. Meadows; "Ceramar".
 - 2. Neoprene complying with ASTM D 1056, Grade 2A1; of width and thickness indicated.
 - a. Basis of Design Product: Hohmann & Barnard, "NS Closed Cell Neoprene Sponge".
 - 3. Thickness:
 - a. Jambs 3/8 inch.
 - b. Expansion Joints: 1/2 inch.
 - 4. Width:
 - a. Expansion joints above base flashing: 3 inches, held back 1 inch.
 - b. Expansion joints below base flashing: 6 inches, held back 1 inch.
 - c. Jambs: 4 inches, unless otherwise indicated..
- B. Tubular Compressible Fillers (042000.A36): Pre-molded, neoprene, butyl, EPDM or silicone tubing complying with ASTM D1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to 26 deg. F. Provide products with low compression set and of shapes and sizes as follows:
- 1. Outside diameter shall be 1/4 inch greater than air cavity between face brick and backup construction.
 - 2. Basis of Design Product: Subject to compliance with requirements, provide "Insul-Tube" by Namoco K-Flex.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
- 1. Wicking Material/Rope Weeps (042000.A38): Absorbent rope, made from cotton, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.
 - 2. Mesh Weep/Vent (042000.A39): Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
 - 2) CavClear/Archovations, Inc.: CavClear Weep Vents.
 - 3) Hohmann & Barnard, Inc.: Mortar Trap Weep Vents.
 - b. Size: Weep shall be sized for full vertical dimension of masonry units indicated.

- E. Cavity Drainage Material (042000.A40 - **Type 1**): Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Mortar Net USA, Ltd.; "Wall Defender".
 - b. Mortar Net Solutions; "MortarNet with Insect Barrier".
 - c. Comparable products from other manufactures submitted to and accepted by Architect prior to bidding will be considered.
 2. Thickness: 2 inches.
 3. Configuration: Provide the following:
 - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
- F. Isolation Strip Flashing (042000.A42): Provide self-adhering, polyethylene-sheet backed rubberized asphalt membrane, 40 mils thick.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work included, but are not limited to, the following:
 - a. Air-Shield by W. R. Meadows, Inc.
 - b. Blueskin by Henry Corp.
 - c. CCW 705 by Carlisle Coatings & Waterproofing.
 - d. Hyload S/A Through Wall Flashing by Hyload, Inc.

2.14 FOAMED-IN-PLACE MASONRY CELL FILL INSULATION (042000.A44)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide "Core-Fill 500" as manufactured by Tailored Chemical Products, Inc. Comparable products from other manufacturers, meeting specified requirements, will be considered when submitted to and accepted by Architect.
1. General Description: Cell fill insulation shall be a two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.
 2. Product Characteristics:
 - a. Thermal Values: "R" Value of 4.91/inch @ 32 degrees F mean; ASTM C-177.
 - b. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 53 and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8" wall assembly (ASTM E 90-90).
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
1. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively when tested in accordance with ASTM E 84.
 2. Combustion Characteristics: Must be noncombustible, Class A building material.

2.15 CAVITY-WALL INSULATION (042000.A45)

- A. Polyisocyanurate Board Insulation: Refer to Section 072100 for requirements.
1. Provide behind steel lintels prior to installation of through-wall flashing and at other locations where indicated. Shape to configurations shown.
- B. General: Refer to Section 072100 for miscellaneous rigid insulation installed under this Section.
1. Application: Refer to details for application of rigid insulation:
 - a. Below base flashing (through wall flashing).
 - 1) Provide extruded polystyrene (XPS) insulation (072100.A01).
 - 2) Thickness: 2 inches.
 - b. Above base flashing (through wall flashing).
 - 1) Provide polyisocyanurate insulation (072100.A04).
 - 2) Thickness: 3 inches.

2.16 MINERAL WOOL INSULATION

- A. Unfaced, Rigid Glass Mineral Wool Board Insulation: ASTM C 612, Type IVB; with maximum flame spread and smoke developed indexes of 0 and 0, respectively, per UL 723 Certification, passing ASTM E 136 for non-combustion characteristics.
 - 1. Nominal density of inner layer 4.1 lb/cu. ft. and of outer layer 6.2 lb/cu. ft.
 - 2. Thermal resistivity of 4.3 hr.sq.ft.F/Btu
 - 3. Thickness: As required behind loose steel lintels.
 - 4. Width: 16 inches
 - 5. Basis-of-Design Product: Subject to compliance with requirements, provide the following or equal:
 - a. Roxul Inc; Cavity Rock DD.
 - b. Thermafiber Inc.; an Owens Corning company

2.17 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. Do not use acidic cleaners on manufactured stone masonry.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.18 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for 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 S.
 - 2. For reinforced masonry, use Type S.
 - 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls, use Type S.
 - 4. For interior load-bearing walls, use Type S.
 - 5. For interior nonload-bearing partitions, use Type N.
 - 6. For exterior masonry veneer, use Type N.
 - 7. For other applications where another type is not indicated, use Type N.
- D. 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. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.19 MATERIALS FOR CLEANING OF EXISTING MASONRY

- A. General: Cleaning methods are to be tested on field sample mockup areas and are to progress from least harsh (bucket and brush) method to more harsh (chemical cleaning) methods.

- B. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.
- C. Warm Water: Heat water to temperature of 140 deg F-180 deg F (60 deg C-82 deg C).
- D. Brushes: Fiber bristle only.
- E. Brick Cleaner: Manufacturer's alkaline masonry cleaner.
 - 1. Product: Subject to compliance with requirements, provide one of the following:
 - a. Enviro Klean "ReKlaim" cleaner and Sure Klean "Limestone and Masonry Afterwash", both as manufactured by ProSoCo, Inc.
 - 1) For mold and mildew removal, provide Enviro Klean "ReVive" by ProSoCo.
 - b. Diedrich Chemicals; comparable product.
- F. Protective Film: For windows, glass, metal and polished stone surfaces during acidic and alkaline masonry cleaning, use self-adhesive, translucent polyethylene protective film.
 - 1. Products: 3M Long-mask Masking Tape #2090 and the self-adhesive, thin, window protection film by 3M, 3M Protective Tape 2A26B. Catalog No. RM2090, 24" or 35" side.
- G. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume.
 - 1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.
 - 2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 45 degrees.
- H. Chemical Cleaning Solutions:
 - 1. When recommended by chemical cleaner manufacturer, dilute chemical cleaning materials with water to produce solutions of concentration indicated but not greater than that recommended by chemical cleaner manufacturer.

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.
 - 5. Verify that fluid applied air barrier and bellows are complete.
- 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 singlewythe 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. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. 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.
- H. Do not lay units containing with surface chips larger than a nickel.
- I. Coordination with Spray-Applied Membrane Air Barrier Coating: Adjustable veneer anchors shall be installed after to application of air barrier.
- J. Fluid Applied Air Barrier Requirements: This project will have fluid-applied Air Barrier material applied to the cavity side of the CMU. Special attention and care must be taken to provide a smooth, filled surface to receive the membrane. The care is necessary to insure the design performance of the selected materials. Concrete masonry unit (CMU) wall shall be prepared as follows to accept the air & vapor barrier:
 - 1. Surfaces shall be free of contaminants such as grease, oil and wax on surfaces to receive membrane.
 - 2. CMU surfaces shall be free from projections.
 - 3. Strike all mortar joints flush to the face of the concrete block.
 - 4. Fill all voids and holes greater than 1/4 inch across at any point with mortar, sealant or other approved fill material.
 - 5. Surface irregularities exceeding 1/4 inch in height or sharp to touch shall be ground flush or made smooth.
 - 6. Fill around all penetrations with mortar, sealant or other approved fill material and strike flush.
 - 7. Remove mortar droppings on brick ties, shelf angles, brick shelves or other horizontal obstructions.

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 or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch 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, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch 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, with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 - 5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch 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: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. Bond patterns shall match existing bond pattern in same location.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. 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.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. 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.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
 - 1. Fill cores in exterior masonry veneer and hollow CMUs with grout or mortar under through-wall flashing.
 - 2. Fill base of wall between exterior masonry veneer and CMUs (collar joint) with grout as indicated and apply mortar across top if insulation and grout to form a mortar wash directly beneath horizontal leg of through-wall flashing.
- I. 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 clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 - 1. Fully bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Fully bed webs in mortar in grouted masonry, including starting course on footings.
 - 3. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 4. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
 - 5. For concrete unit masonry at window infills, provide horizontal joint reinforcement at 16 inches on center vertically starting at 8 inches above bottom of opening. Provide mesh ties secured to sides of existing opening, spaced vertically to match horizontal joint reinforcing.
- 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. Exposed Joints: Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Covered Joints: Cut joints flush where indicated to receive the following finishes unless otherwise indicated.
 - 1. Strike mortar joints flush in exterior face of CMU walls that receive finishes noted below to provide smooth trowel-cut mortar joints, struck full and flush.
 - a. Fill all voids and holes, particularly in the mortar joints by striking joint flush.
 - b. Mortar joints shall be free of voids exceeding 1/4 inch across.
 - 2. Finishes:
 - a. Waterproofing
 - b. Moisture Barrier.
 - c. Cavity wall insulation
 - d. Fluid applied air barriers
 - e. Other direct-applied finishes (other than paint).

3.6 FOAMED-IN-PLACE MASONRY CELL FILL INSULATION

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows (042000.A46):
 - 1. General:
 - a. Provide continuous 3/8-inch wide vertical joint without full face shell bedding.
 - b. Provide joint relatively free of mortar. Remove mortar as required to allow for sealant joint to be installed.
 - c. Stop reinforcing 2 inches each side of control joint, unless otherwise required.
 - 2. At 4-hour fire-rated walls, 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.

3. At 2-hour fire-rated walls, install sash block on each side of joint, install preformed gasket, rake back mortar to allow for installation of backer rod and sealant, or install square-end block on each side of joint, fill head joint between block with ceramic fiber felt, rake back mortar to allow for installation of backer rod and sealant.
 4. At non-fire-rated walls, 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 (042000.A47):
1. Build in compressible joint fillers where indicated.
 2. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch for installation of compressible filler and, sealant and backer rod specified in Section 079200 "Joint Sealants."
- D. Provide horizontal, pressure-relieving joints (042000.A48) 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.
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

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

3.11 FLASHING, WEEP HOLES, CAVITY VENTS AND CAVITY DRAINAGE

- A. General:
1. Install embedded flashing, weep holes and cavity drainage material in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 2. 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 (creating a "mortar wash" sloping towards exterior face of wall) and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - a. Where flashing is within air cavity, place through-wall flashing on sloping bed of mortar (creating a "mortar wash").
 - b. At bases of walls, where flashing abuts a vertical obstruction such as hollow metal frame, aluminum frame, etc., place through-wall flashing on sloping bed of mortar (creating a "mortar wash") to slope away from obstruction for 4 inches.
 2. At lintels and shelf angles, extend flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams. Extend flashing up exterior face of backup substrate not less than 16 inches and terminate with terminations bars and sealant as previously specified. Trim flashing at end dams flush to exterior brick face.
 3. Drip Edges: Provide metal drip edges beneath flexible flashing (through wall flashing) at exterior face of wall at all locations where through-wall flashing extends to exterior. Extend 1/2 inch beyond exterior face of outer wythe and pre-bend to form a drip.
 - a. Adhered stainless steel drip edge to lintel and adhered to flexible through-wall flashing on top of drip edge, overlapping 1-1/2 inches, minimum. Through wall flashing shall be held back from exterior face of masonry 1/2 inch.
 4. Termination Drip Edging: Provide stainless steel termination drip edging over exposed exterior flanges of lintels.
 5. Cores: Fill cores in masonry below flexible through-wall flashing with mortar.
 6. Cut exposed vertical edges of flexible flashing end dams off flush with face of wall after mortar is set.
 7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install counterflashing receivers and nailers for flashing and other related construction where they are shown to be built into masonry.
 - 1. Fill cavity behind veneer with insulation as required to support mortar wash.
 - 2. Install receiver with back down leg tight to brick.
 - 3. Form mortar wash starting at back of brick and slope upward 1/2 inch at backup wall.
 - 4. Install windowsill receiver (pan) starting at back of window line.
- E. Install weep holes/cavity vents in exterior wythes and veneers at head joints of first course of masonry immediately above embedded flashing.
 - 1. At single-wythe CMU flashing system, install weep vents in head joints at base of second course of masonry.
 - 2. Use specified weep/cavity vent products to form weep holes.
 - 3. 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.
 - 4. Space weep holes/cavity vents at 24 inches o.c. unless otherwise indicated.
 - 5. Space weep holes formed from wicking material 16 inches o.c.
 - 6. Trim wicking material flush with outside face of wall after mortar has set.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- G. Install cavity vents in head joints in exterior wythes at 24 inches on center. Use specified weep/cavity vent products to form cavity vents.

3.12 MOISTURE BARRIER

- A. Refer to Section 071326 "Self Adhered Sheet Waterproofing" for additional moisture barrier system installation requirements.
- B. Prepare masonry surface so they are smooth and free from projections that could puncture moisture barrier.
- C. Prime CMU wall surface then install moisture barrier.
- D. Roll entire surface then seal all lap seams with mastic.
- E. Schedule work so moisture barrier is not exposed to UV more than 30 days or protect from UV.

3.13 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:
 - 1. Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 2. 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.
 - 3. Do not reconsolidate self-consolidating grout.
 - 4. Limit height of vertical grout pours to not more than 60 inches.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to TMS 402/ACI 530/ASCE 5 as follows:
- C. Inspections: Special inspections according to TMS 402/602-16 as follows:
 - 1. Level "2" for all areas except High Wind Areas.
 - 2. Level "3" for High Wind Areas.
 - 3. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 4. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 5. Place grout only after inspectors have verified proportions of site-prepared grout.
- D. Inspections: Special inspections according to TMS 602 as follows:
 - 1. Level "2" for all areas.
 - 2. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 3. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 4. Place grout only after inspectors have verified proportions of site-prepared grout.
- E. Testing Prior to Construction: One set of tests.
- F. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof. Reference the Statement of Special Inspections for additional requirements.
- G. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- H. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- I. Mortar Aggregate Ratio Test (Proportion Specification): For site-mixed mortar, test each mix provided, according to ASTM C 780.
- J. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- K. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.15 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 mockup 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. Initially, clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20. Where initial cleaning results are not satisfactory as judged by Architect from testing on mockup, proceed to cleaning with proprietary cleaners.
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.

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

3.17 SURFACE PREPARATION FOR FLUID APPLIED AIR BARRIERS

- A. General: This project will have fluid-applied Air Barrier material applied to the cavity side of the CMU. Special attention and care must be taken to provide a smooth, filled surface to receive the membrane. The care is necessary to insure the design performance of the selected materials. Concrete masonry unit (CMU) wall shall be prepared as follows to accept the air & vapor barrier:
 1. Surfaces shall be free of contaminants such as grease, oil and wax on surfaces to receive membrane.
 2. CMU surfaces shall be free from projections.
 3. Strike all mortar joints flush to the face of the masonry units.
 4. Fill all voids and holes greater than 1/4 inch across at any point with mortar, sealant or other approved fill material.
 5. Surface irregularities exceeding 1/4 inch in height or sharp to touch shall be ground flush or made smooth.
 6. Fill around all penetrations with mortar, sealant or other approved fill material and strike flush.
 7. Remove mortar droppings on brick ties, shelf angles, brick shelves or other horizontal obstructions.

3.18 CLEANING OF EXISTING BRICK MASONRY

- A. General Cleaning of Masonry:
 1. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
 2. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.
 3. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.
 4. Water Application Methods: Spray Applications: Spray-apply water to masonry surfaces to comply with requirements indicated for location, purpose, water temperature, pressure, volume and equipment. Unless otherwise indicated, hold spray nozzle not less than 6" from surface of masonry and apply water from side to side in overlapping bands to produce uniform coverage and an even effect.
 - a. Low Pressure Spray: 100-400 psi; 3-6 gallons per minute.
 - b. Medium Pressure Spray: 400-800 psi; 3-6 gallons per minute (only upon approval of Architect).
 - c. High Pressure Spray: Only allowed when approved by Architect and based upon field sample mockup testing results.
 - d. Steam Wash: Apply steam to masonry surfaces at pressures not exceeding 80 psi. Hold nozzle no less than 6" from surface of masonry and apply steam from side to side or in direction of tooling in overlapping bands to produce uniform coverage and an even effect.
 5. Chemical Cleaner Application Methods: Use only when directed by Architect, after performing water only cleaning methods described above.
 - a. General: Apply chemical cleaners to masonry surfaces to comply with chemical manufacturer's recommendations using brush or spray application methods, at Contractor's option, unless otherwise indicated. Do not allow chemicals to remain on surface for periods longer than that indicated or recommended by manufacturer.
 - b. Spray Application: Apply to pressures not exceeding 50 psi, unless higher pressure is recommended by chemical cleaner manufacturer.

- c. Reapplication of Chemical Cleaners: Do not apply chemical cleaners to same masonry surfaces more than twice.
- B. Cleaning Brickwork:
 - 1. Cold Water Wash: At locations indicated, clean brick masonry surface with cold water applied as follows:
 - a. Low pressure spray.
 - b. Medium pressure spray.
 - 2. Warm Water Wash: At locations indicated, clean brick masonry surfaces with warm water applied as follows:
 - a. Low pressure spray
 - b. Medium pressure spray.
 - 3. Chemical Cleaning: At locations indicated, clean brick masonry surfaces with chemical cleaner applied as follows:
 - a. Prewet masonry with cold water applied by low pressure spray.
 - b. Prewet masonry with warm water applied by low pressure spray.
 - c. Apply chemical cleaner to masonry. Let cleaner remain on surface for period determined from preconstruction testing, scrub and thoroughly rinsing away:
 - 1) As recommended by chemical cleaner manufacturer and preconstruction testing.
 - d. Rinse masonry with chemical afterwash to remove chemicals and soil, applied by medium pressure spray.
 - e. Repeat chemical cleaning procedure above where required to produce effect established by mock-up. Do not apply more than twice.
 - f. Do not clean brick work prior to seven (7) days after completion of the tuckpointing.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural steel (051200.A01), including, but not limited to the following:
 - a. Plate and Bar (051200.A05)
 - b. Hollow Structural Steel Shapes (051200.A06)
 - 2. Shrinkage-resistant grout (051200.A08).
 - 3. Structural thermal break material.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012200 "Unit Prices" for unit prices relating to work of this Section
 - 3. Section 012300 "Alternates" for alternates effecting work of this Section.
 - 4. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 5. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.
 - 6. Section 099600 "High Performance Coatings".

1.2 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."

1.3 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 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.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site at biweekly intervals.
 - 1. Before installation of structural steel framing, review procedures and tolerances for ensuring quality of structural steel framing materials. Require representatives of each entity directly concerned with structural steel framing to attend, including but not limited to the following:
 - a. Owner's representative
 - b. Architect and/or Structural Engineer.
 - c. Contractor's superintendent.
 - d. Structural Steel Framing subcontractor.
 - e. Manufacturer's representative for structural steel framing.
 - 2. Review field quality control measures for the following items:
 - a. Field dimensions and tolerances for structural steel framing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each of the following:
 - 1. Structural-steel materials.

2. High-strength, bolt-nut-washer assemblies.
 3. Shear stud connectors.
 4. Anchor rods.
 5. Threaded rods.
 6. Shop primer.
 7. Galvanized-steel primer.
 8. Etching cleaner.
 9. Galvanized repair paint.
 10. Shrinkage-resistant grout.
 11. Structural thermal break materials.
- 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.
 5. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Submit for each of the following.
1. Installer.
 2. Fabricator.
 3. Professional engineer.
- 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. Shear stud connectors.
 5. Shop primers.
 6. Shrinkage-resistant grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.7 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 or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE, and as follows:

1. A firm with not less than ten (10) years of experience under the current name.
 2. Must have completed five (5) projects within the past 5 years of comparable size and scope.
 3. Non-certified erectors shall submit their qualifications with their bid. Qualifications shall be submitted on AIA Document A305 "Qualifications Statement", include the following for each project listed: references for at least 3 projects, identify engineer-of-record, tonnage of steel erected and type of steel erected (structural, miscellaneous, etc.).
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. 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."

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with structural steel framing by field measurements before fabrication.

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. Details to be completed by structural-steel fabricator, include a comprehensive engineering analysis by a qualified professional engineer, 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 Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Combined system of moment frame, braced frame, and shear walls.

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 following:
1. W-Shapes: 60 percent.
 2. Plate and Bar: 25 percent.

3. Hollow Structural Sections: 25 percent.
 4. All Other Steel Materials: 25 percent.
- C. Plate and Bar (051200.A05): ASTM A 36/A 36M.
- D. Hollow Structural Sections (051200.A06): ASTM A 500/A 500M, Grade C, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, 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. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain.
- D. Box Bolts / Blind Bolts:
1. Basis-of-Design Product: Subject to compliance with requirements, provide LNA Solutions; "BoxBolt Type C Blind Fastener" or comparable product submitted to and accepted by Architect prior to bidding.
 2. Product Characteristics:
 - a. Core bolt shall be manufactured from steel complying with ISO 4017, Grade 8.8.
 - b. Body, collar and cone shall be manufactured from steel complying with BS EN 10083, Grade 1.1151.
 - c. Finish shall be manufacturer's proprietary coating similar to GEOMET 321 XL.
 3. Product Certifications: Boxbolt/Blind Bolt shall be ICC Certified.
- E. Expansion Bolt for Structural Steel:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Lindapter; "Hollo-Bolt" or comparable product submitted to and accepted by Architect prior to bidding.
 2. Product Characteristics: As required by manufacturer for performance required by Structural Drawings.
 - a. Finish and material shall be as recommended by manufacturer for exterior use.
 3. Product Certifications: Expansion Bolt shall be ICC Certified.
- F. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.
1. Configuration: Straight.
 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 5. Finish: Plain.
- B. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
1. Nuts: ASTM A 563 heavy-hex carbon steel.
 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 4. Finish: Plain.
- C. Threaded Rods: ASTM A 36/A 36M.
1. Nuts: ASTM A 563 heavy-hex carbon steel.

2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Plain.

2.5 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.6 FILLER

- A. Filler: Polyester filler intended for use in repairing dents in automobile bodies.

2.7 SHRINKAGE-RESISTANT GROUT (051200.A08)

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

2.8 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/A 6M 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.
 2. Thermal Cutting is not allowed at the project site.
- 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 SSPC-SP 1, "Solvent Cleaning," or SSPC-SP 2, "Hand Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.
- H. 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. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.9 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.
- B. Weld Connections: Comply with AWS D1.1/D1.1M 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. Erection plates shall be removed after welding and prior to finishing.
 - 3. Exposed welded connections lower than 25'-0" above finished floor shall be finished to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

2.10 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 (not exposed-to-view in final position).
- 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."
 - 2. SSPC-SP 6/NACE No. 3, "Commercial Blast 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.

2.11 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 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 welded door frames attached to structural-steel frame and located in exterior walls.
 - 3. Galvanize all exterior exposed structural steel.

2.12 STRUCTURAL THERMAL BREAK MATERIAL

- A. Basis of Design: Subject to compliance with requirements, provide "Fabreeka – TIM" by Fabreeka or a comparable product submitted to and accepted by Architect prior to bidding, with the following product characteristics.
 - 1. Description: Material shall maintain structural integrity of connections. Refer to Structural Drawings for specific load requirements.
 - 2. Thickness: 1 inch unless indicated otherwise on Structural Drawings.
 - 3. Ultimate Material Properties:
 - a. 11,000 psi (75.8 MPa) per ASTM D638.

- b. 25,000 psi (172.4 MPa) per ASTM D790.
 - c. 38,900 psi (26832 MPa) per ASTM D695.
- 4. Compressive Modulus:
 - a. 291,194 psi (2,007.7 MPa) per ASTM D695.
 - b. 519,531 psi (3582.0 MPa) per ASTM D695.
 - c. 15,000 psi (103.4 MPa) per ASTM D732.
 - d. 21.8% per ASTM D2863.
- 5. Coefficient of Thermal Expansion: 2.2 per ASTM D696.
 - a. 1.8 BTU/Hr/sf/in/Deg F (0.259 W/m*deg K) per ASTM C177.
 - b. 107.83 lb/cf (1727 Kg/cubic meter).
- 6. Coefficient of Friction Values with Steel: 0.27 (at 5,000 psi) and 0.26 (10,000 psi).

2.13 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will 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 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/D1.1M 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/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.
- F. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents
- G. Special Inspections: Owner will retain and pay for the services of a qualified independent inspection agency acceptable to the Architect to conduct special inspections of all structural welding and high-strength bolting in accordance with applicable requirements of Section 1704 of the International Building Code, latest edition, as adopted and amended by authority having jurisdiction. The inspection agency shall inspect the work, prepare and submit periodic reports and final reports to City Code Officials, Architect, and Owner in compliance with building code requirements.

2.14 DECORATIVE METAL FINISHING

- A. Blackened Finish: Where surfaces are indicated to receive blackened finish, provide manufacturer's recommended non-staining metal finish acceptable to Architect and Owner prior to finishing of final work. Sample of factory and site finishing methods shall be provided to and accepted by Architect and Owner prior to finishing of work.

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. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. 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.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Structural Engineer of Record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- I. Structural Thermal Break Material: Install per manufacturer's written recommendations to achieve load performance indicated by Structural Drawings. Installation methods shall be submitted to Structural Engineer for review of compliance with design intent only.

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.
- B. Weld Connections: Comply with AWS D1.1/D1.1M 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, 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: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 - 2. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - a. 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:
 - 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.
- C. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M 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/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

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/A 780M.
- B. Touchup Prime 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 for Steel in Natatorium and Pool Equipment Room: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

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SECTION 054000 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following applications of cold-formed metal framing (054000.A01):
 - 1. Load-bearing wall framing (054000.A02).
 - 2. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.
 - 3. Miscellaneous framing and furring members (054000.A07).
 - 4. Miscellaneous materials.
 - a. Isolation Strip (054000.A08)
 - b. Sealer Gaskets
 - c. Flat straps and backing plates (054000.A09).
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
 - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
 - 4. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
 - 5. Section 092116 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before installation of cold formed metal framing, review procedures and tolerances for ensuring quality of metal framing materials. Require representatives of each entity directly concerned with cold-formed metal framing to attend, including but not limited to the following:
 - a. Owner's representative
 - b. Architect.
 - c. Contractor's superintendent.
 - d. Cold Formed Metal Framing subcontractor.
 - e. Manufacturer's representative for cold-formed metal framing.
 - 2. Review field quality control measures for the following items:
 - a. Field dimensions and tolerances for cold formed metal framing installation.
 - b. Coordination of items where blocking is required

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 3. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency and professional engineer.

- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Power-actuated anchors.
 - 3. Mechanical fasteners.
 - 4. Vertical deflection clips.
 - 5. Horizontal drift deflection clips
 - 6. Miscellaneous structural clips and accessories.
- D. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Product Tests: Mill certificates or data from a qualified independent testing agency, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- D. 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.
- E. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- F. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing:
 - 1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. All Steel and Gypsum Products.
 - 2. CEMCO; California Expanded Metal Products Company.
 - 3. Clark-Dietrich Building Systems.
 - 4. Custom Stud, Inc.
 - 5. Engineered Steel Products, Inc.
 - 6. MBA Building Supplies.
 - 7. MarinoWare; a division of Ware Industries.

8. SCAFCO Corporation.
9. Steel Construction Systems.
10. Steel Network, Inc.
11. Steel Structural Systems.
12. United Metal Products, Inc.

2.2 INSTALLERS

- A. Installers: Subject to compliance with requirements, acceptable installers for cold-formed metal framing include the following:
1. Total Interiors.
 2. KD Christian.
 3. Drewco.
 4. E & K.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated in per Code and the Structural General Notes.
 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height, except for walls indicated to receive brick, horizontal deflection of 1/600 of the wall height.
 - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240, except for walls indicated to receive thin brick, horizontal deflection of 1/600 of the wall height.
 - d. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - e. Floor Joist Framing: Vertical deflection of 1/480 for live loads and 1/240 for total loads of the span.
 - f. Ceiling Joist Framing: Vertical deflection of 1/240 of the span for live loads and 1/240 for total loads of the span.
 - g. Soffit Framing: Vertical deflection of 1/240 of the span for live loads and 1/240 for total loads of the span.
 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch.
 5. Design interior non-load-bearing framing as required for structural performance, including but not limited to: windows systems, operable walls, soffits and ceilings.
 6. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
1. Floor and Roof Systems: AISI S210.
 2. Wall Studs: AISI S211.
 3. Headers: AISI S212.
 4. Lateral Design: AISI S213.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.4 COLD-FORMED STEEL FRAMING, GENERAL (054000.A01)

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60.
- C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60.

2.5 LOAD-BEARING WALL FRAMING (054000.A02)

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0428 inch.
 2. Flange Width: 1-5/8 inches.
 3. Section Properties: Per SSMA or as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: 1-1/4 inches.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0428 inch.
 2. Flange Width: 1-5/8 inches.
 3. Section Properties: Per SSMA or as required by structural performance.
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
 1. Minimum Base-Metal Thickness: 0.0428 inch.
 2. Top Flange Width: 1-5/8 inches.
 3. Section Properties: Per SSMA or as required by structural performance.
- E. Vertical Deflection and Drift Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Clark-Dietrich Metal Framing
 - b. MarinoWare, a division of Ware Industries
 - c. SCAFCO Corporation.
 - d. The Steel Network
- F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0538 inch.
 - b. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: Matching steel studs.

- b. Flange Width: 3 inches.
- G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- H. Horizontal Steel Strapping (054000.A09): Manufacturer's standard flat strapping on exterior face of steel studs at masonry termination bars and as follows (unless otherwise noted on the drawings):
 - 1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - 2. Face Width: 4 inches, unless otherwise indicated.

2.6 INTERIOR NON-LOAD BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness:
 - a. For horizontal framing members: 0.0428 inch
 - b. For vertical framing members (where welding occurs): 0.0966 inch.
 - 2. Flange Width: 1-5/8 inches.
 - 3. Section Properties: Per SSMA or as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0538 inch.
 - b. Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.
 - 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0428 inch.
 - b. Flange Width: 3 inches.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- F. Steel Strapping:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Face Width: 4 inches.

2.7 MISCELLANEOUS FRAMING (054000.A07)

- A. General: Manufacturer's standard Z-shaped and hat-shaped steel sections, of web depths indicated, and as follows:
 - 1. Minimum Uncoated Base-Metal Thickness: 0.0538 inch.
 - 2. Z-Furring: Manufacturer's standard slotted or non-slotted web, face flange of at least 1-1/4 inches and wall attachment flange of 7/8 inch.
 - 3. Hat Channels: Manufacturer's standard profile.
 - 4. Depth/Height:
 - a. For Z-furring: 3 inches, unless otherwise indicated.
 - b. For hat channels: 7/8 inch, unless otherwise indicated.

2.8 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole-reinforcing plates.
 - 11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: Torque-controlled adhesive anchor or adhesive anchor.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.
- E. Isolation Strip beneath Runner Tracks at Exterior Walls (054000.A08): Provide one of the following:
 - 1. Polyethylene-sheet backed rubberized asphalt membrane, 40 mils thick. Field cut to match widths of runners.
 - 2. Lamatek; 0.25 inch by 5.87 inches SCE-41 plain neoprene sponge rubber. Furnish in not less than 50 foot rolls.

2.11 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- C. Install isolation strips beneath runner tracks at exterior walls.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
 - 1. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches, unless specifically indicated otherwise.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- E. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
 - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

- F. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- G. Install horizontal bridging in stud system, spaced vertically 48 inches as indicated on Shop Drawings. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
- H. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- I. Install horizontal strapping at center line of masonry flashing termination bar. Coordinate locations with mason.
- J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR AND INTERIOR NON-LOAD BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Do not fasten studs to outer track of double deflection tracks.
 - 2. Stud Spacing: 16 inches, maximum.
 - 3. Additional Studs: Space 8 inches from opening jambs and each side of veneer expansion joints. Coordinate stud spacing with other masonry anchor locations.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Do not fasten studs to outer track of double deflection tracks.
 - 2. Install single deep-leg deflection tracks and anchor to building structure.
 - 3. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 4. Connect vertical deflection clips to bypassing and infill studs and anchor to building structure.
 - 5. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.
 - 1. Strapping: Before installing sheathing, install continuous strapping at backup location for termination bar at the top of veneer base flashing and lintel flashing.
- G. Install horizontal strapping at center line of masonry flashing termination bar. Coordinate locations with mason.

3.6 CEILING AND SOFFIT FRAMING INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

- B. Install joists level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame or flange of joist track as occurs, with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than 2 inches from abutting walls parallel with joists, and as follows:
 - 1. Joist Spacing: 16 inches.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 MISCELLANEOUS FRAMING INSTALLATION

- A. General:
 - 1. Where miscellaneous framing is installed parallel to stud framing in wall, align miscellaneous framing over studs. Securely anchor at corners and ends, and at spacings as follows:
 - a. Anchor Spacing: As shown on Shop Drawings.
 - 2. Where miscellaneous framing is installed perpendicular to stud framing in wall, secure over studs. Securely anchor at corners and ends, and at spacing as follows:
 - a. Anchor Spacing: As shown on Shop Drawings.
 - 3. Set miscellaneous framing plumb, level and true to plane.

3.8 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.9 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

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SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous Steel Framing and Supports (055000.A01) for:
 - a. Storefront and curtain wall.
 - b. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Shelf angles (055000.A05).
 - 3. Miscellaneous steel trim (055000.A13).
 - 4. Metal bollards (055000.A14).
 - 5. Loose bearing and leveling plates (055000.A21) for applications where they are not specified in other Sections.
 - 6. Slotted-channel inserts and ceiling assembly.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels (055000.A22).
 - 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 012100 "Allowances" for those allowances effecting work of this Section.
 - 2. Section 012200 "Unit Prices" for those unit prices effecting work of this Section.
 - 3. Section 012300 "Alternates" for those alternates effecting work of this Section.
 - 4. 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.
 - 5. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 6. Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.

1.2 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Paint products.
 - 3. Shrinkage-resisting grout.
 - 4. Pipe Downspout guards.
 - 5. Slotted channel framing.
- B. 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. Miscellaneous steel framing and supports.
 - a. Steel framing and supports for countertops.
 - b. Steel framing and supports for mechanical and electrical equipment.
 - c. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 2. Trash Enclosure Supports and accessories.
 - a. Supports and framing for trash enclosure gates.
 - b. Supports and framing for trash enclosure.
 - c. Supports and framing for pipe gates.
 3. Shelf angles.
 4. Metal bollards.
 5. Metal downspout boots.
 6. Loose steel lintels.
- C. Samples for Verification: For each type and finish of extruded nosing and tread.
- D. Delegated-Design Submittal: For items indicated under Performance Requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design the following.
 - 1. Connections to Building Structure.
 - a. Delegated design engineer shall coordinate with structural engineer to design connections to building structure.
- 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, ambient; 180 deg F, material surfaces.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.2 METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. 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.
- C. Steel Channels, 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 304.
- E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- 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. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallically bonded to steel.
- I. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- J. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- K. Zinc-Coated Steel Wire Rope: ASTM A741.
 - 1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- L. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.
 - 1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- M. Steel Prestressing Strand: ASTM A416/A416M, Grade 270 (Grade 1860), low-relaxation, seven-wire, with 0.9-lb/sq. ft. (4.39-kg/sq. m) zinc coating.
 - 1. Steel Prestressing Strand Fittings: Hot-dip galvanized-steel anchors and connectors with capability to sustain, without failure, a load equal to minimum breaking strength of steel prestressing strand with which they are used.
- N. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4, and as follows:
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.

- 2. Material: Galvanized steel, ASTM A 653/A 653M, with G90 (Z275) coating.
- O. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- P. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- Q. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- R. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- S. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- T. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).
- U. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (lead red brass) or UNS No. C84400 (lead semired brass).
- V. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500.
- W. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, 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.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. 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, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- I. Slotted-Channel Inserts and Ceiling Assembly: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 1-5/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches 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.
 - 1. Refer to Reflected Ceiling Plans on drawings for locations using this product.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 Interior Painting," and Section 099600 "High-Performance Coatings."
- B. 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.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- H. Shrinkage-Resistant 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.
- I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete"
- J. Neoprene Pads: High-strength, multipurpose neoprene rubber pads, smooth texture, thickness as indicated on drawings (ENGINEER SHOW THICKNESS), complying with ASTM D2000 BC, with a durometer rating of 50A and minimum tensile strength of 1,400 psi.
 - 1. Basis of Design: McMaster-Carr Product No. 1290N36 (12" x 12" sheet).

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch 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, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS (055000.A01)

- 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.
 - 3. Galvanize miscellaneous framing and supports for exterior application and where indicated for interior applications.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer, if not exposed to view; or primer specified in Section 099600 "High-Performance Coatings" where exposed to view or painted.

2.7 SHELF ANGLES (055000.A05)

- 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 bolts, spaced not more than 6 inches from ends and 24 inches 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 larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 MISCELLANEOUS STEEL TRIM (055000.A13)

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime miscellaneous steel trim with zinc-rich primer, if not exposed to view; or primer specified in Section 099600 "High-Performance Coatings" where exposed to view or painted.

2.9 METAL BOLLARDS (055000.A14)

- A. Refer to Section 129300 "Site Furnishings" for pre-manufactured Bollards.
- B. Fabricate metal bollards from Galvanized Schedule 40 steel pipe.
- C. Fabricate bollards with 6 inch outside diameter. Embedded in concrete with headed stud anchors as indicated on Drawings.
- D. Prime bollards with zinc rich primer.

2.10 LOOSE BEARING AND LEVELING PLATES (055000.A21)

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

2.11 LOOSE STEEL LINTELS (055000.A22)

- 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 unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer, if not exposed to view; or primer specified in Section 099600 "High-Performance Coatings" where exposed to view or painted.

2.12 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.

2.13 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.

2.14 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 is 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.
- F. Blackened Finish: Where surfaces are indicated to receive blackened finish, provide manufacturer's recommended non-staining metal finish acceptable to Architect and Owner prior to finishing of final work. Sample of factory and site finishing methods shall be provided to and accepted by Architect and Owner prior to finishing of work.

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 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.

- G. Connect downspout boots to downspouts and to subdrainage system vertical risers as recommended by boot manufacturer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions and overhead doors securely to, and rigidly brace from, building structure.

3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
 - 1. Embed anchor bolts at least 4 inches in concrete.
- B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.
 - 1. Do not fill removable bollards with concrete.
 - 2. Contractor's Option: Provide precast concrete tops. Class A form finish with 5000 psi concrete reinforced with microfibers.
 - a. Basis of Design Product: Subject to compliance with requirements provide "Top Gard Pipe Bollard Cap" by TopGard Construction Products.
 - b. Size: To accommodate bollard diameter. Coordinate with Drawings.
 - c. Bolts: Provide quantity by manufacturer's written specifications according to precast top size.

3.4 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 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 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" and 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.

END OF SECTION

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SECTION 061000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous framing with dimension lumber (061000.A01).
 - 2. Wood blocking, cants, and nailers (061000.A13).
 - 3. Preservative-treated wood blocking, cants and nailers (061000.A12).
 - 4. Fire-Retardant-Treated Wood blocking and nailers (061000.A16).
 - 5. Wood furring and grounds (061000.A15, 061000.A18).
 - 6. Plywood blocking panels (061000.A19).
 - 7. Fire retardant treated plywood blocking and backing panels (061000.A20).
 - 8. Sill-Sealer Gaskets (061000.A11).
 - 9. Flexible Strip Flashing (061000.A24).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for those alternates effecting work of this Section.

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 size or greater but less than 5 inches nominal size in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NLGA: National Lumber Grades Authority.
 - 2. SPIB: The Southern Pine Inspection Bureau.
 - 3. WCLIB: West Coast Lumber Inspection Bureau.
 - 4. WWPA: Western Wood Products Association.

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 materials comply 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 materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. 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.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Power-driven fasteners.

5. Post-installed anchors.
6. Expansion anchors and metal framing 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products 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: The following wood products shall be 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.
 1. Dimension lumber, except treated materials.
- B. Certified Wood: The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.
 1. Dimension lumber, except treated materials.
- C. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.
- E. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 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. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 3. 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.
 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
1. Framing for raised platforms and stages.
 2. Plywood blocking and backing panels.
 3. Roof construction.

2.4 DIMENSION LUMBER FRAMING

- A. Miscellaneous Framing (061000.A01): No. 2 grade.
1. Species:
 - a. Hem-fir (north); NLGA.
 - b. Mixed southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWPA.
 2. Refer to Article 2.2 and Article 2.3 for locations of preservative treated wood and fire retardant treated wood.

2.5 ENGINEERED WOOD PRODUCTS

- A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.
- B. Parallel-Strand Lumber (061000.A04): Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with

an exterior-type adhesive complying with ASTM D 2559.

1. Basis of Design Product: Subject to compliance with design requirements, provide "Parallam Plus PSL with Wolmanized Preservative Protection by TrusJoist/Weyerhaeuser or a comparable product from a different manufacturer with the following product characteristics.
2. Extreme Fiber Stress in Bending, Edgewise: 2,000 psi for 12-inch nominal-depth members.
3. Modulus of Elasticity, Edgewise: 1,660,000 psi.
4. Preservative Treatment: Category UC4a.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Preservative-treated blocking, grounds and nailers (061000.A12).
 2. Blocking, grounds and nailers (061000.A13).
 - a. Blocking for wall-mounted cabinets and casework shall be 2x6, minimum.
 3. Blocking for wall-mounted items shall be 2x6, minimum.
 4. Curbs and cants (061000.A14).
 5. Furring (061000.A15).
 6. Fire-retardant treated wood blocking and nailers (061000.A16).
 7. Fire-retardant treated wood curbs and cants (061000.A17).
 - a. Rooftop equipment bases and support curbs.
 8. Fire-retardant treated wood furring: (061000.A18).
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 1. Mixed southern pine or southern pine; SPIB.
 2. Spruce-pine-fir; NLGA.
 3. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
 4. Western woods; WCLIB or WWP.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWP.
 3. Western woods; WCLIB or WWP.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 MISCELLANEOUS PLYWOOD PANELS

- A. General: DOC PS 1, Exposure 1, CD, non-fire-retardant treated and fire-retardant treated as noted below, in thickness indicated or, if not indicated, not less than 5/8-inch nominal thickness.
 1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 2. Plywood blocking and backing panels, non-fire-retardant treated (061000.A19).
 3. Fire-Retardant-Treated Plywood blocking and backing panels (061000.A20).
 - a. Note that plywood equipment backing panels are specified in Article below.

2.8 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels (061000.A20): Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
 1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.9 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 2. Where rough carpentry is preservative treated or fire-retardant-treated wood materials, provide Type 304 stainless steel fasteners or fasteners with corrosion-protective coating have a salt-spray resistance of more than 800 hours according to ASTM B117.
- 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. 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.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.10 MISCELLANEOUS MATERIALS

- A. Flexible Strip Flashing (061000.A24): Provide self-adhering, membrane, 40 mils thick.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work included, but are not limited to, the following:
 - a. Air-Shield by W. R. Meadows, Inc.
 - b. Blueskin by Henry Corp.
 - c. CCW 705 by Carlisle Coatings & Waterproofing.
 - d. Hyload S/A Through Wall Flashing by Hyload, Inc.
- B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. 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."
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- D. Install plywood blocking and 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.
- E. Do not splice structural members between supports unless otherwise indicated.

- F. 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.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- H. 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.
- I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. ICC-ES evaluation report for fastener.
- L. Use steel common 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 between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

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.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood: Install 1-by-3-inch nominal-size furring vertically at 16 inches o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

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SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Shelving (062023.A11)
 - 2. Clothes rods (062023.A12).
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.
- C. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preserved treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- D. Samples for Verification:
 - 1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
 - 2. For foam-plastic moldings, with half of exposed surface finished; 50 sq. in.
 - 3. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.
 - 4. For each species and cut of trim and molding profile with non-factory-applied finish, with 1/2 of exposed surface finished for each molding profile and one trim profile. Samples shall be at least 8 inches long.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
 - 1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
 - 2. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 1 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's 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. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Grading Agencies and Rules:
 - a. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
 - b. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
 - c. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
 - d. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
 - e. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 - f. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: ANSI A135.4.
- D. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.
- E. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.
- F. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
 - 1. Refer to Drawings for laminate selections.
 - a. Comparable products from other manufacturers will be considered which match colors and patterns to Architect's satisfaction (submit samples) and which are submitted to and accepted by Architect prior to bidding.
- G. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - 1. Colors: As selected by Architect from manufacturer's full range.

2.2 SHELVING AND CLOTHES RODS

- A. Exposed Shelving: Made from the following material, 3/4 inch thick for spans up to 32 inches and 1 inch thick for spans exceeding 32 inches.

1. Exposed shelving shall be fabricated from $\frac{3}{4}$ inch thick medium density particleboard. Top (exposed) face shall receive high pressure laminate, non-exposed face shall receive Grade BKL or CLS (cabinet decorative liner) fabricator's option. All sides shall be self-edges with plastic laminate to match exposed face.
 2. Melamine-faced particleboard with solid-wood front edge.
- B. Closet Shelving: Made from the following material, $\frac{3}{4}$ inch thick for spans up to 32 inches and 1 inch thick for spans exceeding 32 inches.
1. Melamine-faced particleboard with applied-PVC front edge.
- C. Shelf Cleats: $\frac{3}{4}$ -by-5- $\frac{1}{2}$ -inch boards with hole and notch to receive clothes rods, as specified above for hardwood lumber trim for opaque finish.
- D. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
- E. Shelf Brackets without Rod Support: BHMA A156.16, B04041; prime-painted formed steel.
- F. Standards for Adjustable Shelf Brackets: Subject to compliance with requirements, provide Knap & Vogt Manufacturing Co., 85/185 Series Heavy-Duty Commercial Grade Standards and Brackets, including all accessories and fasteners, or comparable product from other manufacturers.
1. Standards shall be 1- $\frac{1}{4}$ inch wide x $\frac{1}{2}$ inch deep, double-slotted design and fabricated from 16 gauge steel. Factory finish in white or anochrome as selected by Architect. Vertically adjustable in 1 inch increments. Fasteners shall be colored to match standards.
 2. Brackets shall be fabricated from 16 gauge steel for 8 to 12 inch lengths and 14 gauge steel for 14 to 24 inch lengths. Brackets shall be of a double-flange, double-lug design to suit standards. Factory finish to match standards. Provide bracket lengths to suit shelving depths indicated.
- G. Clothes Rods: 1- $\frac{1}{2}$ -inch-diameter, clear, kiln-dried hardwood Douglas fir or southern pine.
- H. Rod Flanges: Aluminum or chrome-plated steel.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives shall comply with 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. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- D. Installation Adhesive for Foam-Plastic Moldings: Product recommended for indicated use by foam-plastic molding manufacturer.
- E. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.
- F. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.4 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
1. Interior standing and running trim, except shoe and crown molds.
 2. Wood-board paneling.
- B. Ease edges of lumber less than 1 inch in nominal thickness to $\frac{1}{16}$ -inch radius and edges of lumber 1 inch or more in nominal thickness to $\frac{1}{8}$ -inch radius.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
 - 1. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled.
 - 2. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
 - 3. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing.
 - 4. Remove adhesive that is squeezed out after fastening shelf cleats in place.
- B. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- C. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- D. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- E. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.

1. Install shelves, fully seated on cleats, brackets, and supports.
 2. Fasten shelves to cleats with finish nails or trim screws, set flush.
 3. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- F. Install rod flanges for rods as indicated.
1. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
 2. Install rods in rod flanges.

3.5 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements.
1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- B. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces.
- B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

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SECTION 066400 - PLASTIC PANELING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic sheet paneling (066400.A01)
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring for installing plastic paneling.
 - 2. Section 102600 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.

1.4 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.

1.5 WARRANTY

- A. Furnish one-year guarantee against defects in material and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING (066400.A01) - **WP1**.

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Marlite; "Standard FRP Panels", or comparable product, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
- B. Glass-Fiber-Reinforced Plastic Paneling (066400.A01): Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.
 - 1. Wall materials 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."
 - 2. 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 (Class A).

- b. Smoke-Developed Index: 450 or less.
- 3. Nominal Thickness: Not less than 3/32 inch.
- 4. Surface Finish: Smooth texture.
- 5. Color: As indicated on Material Finish Legend.

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. Adhesive: As recommended by plastic paneling manufacturer.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
- D. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."
 - 1. Sealant shall have a VOC content of 250 g/L or less.

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. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- B. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- C. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- D. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12 inches wide.
 - 1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
 - 2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

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, supplemented with fasteners. 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. 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

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SECTION 072419 - EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Drainable Exterior Insulation and Finish System (EIFS) (072419.A01).
 - 2. Repair and Resurfacing of existing exterior insulation and finish systems (EIFS).
- B. Related Sections:
 - 1. Section 012300 "Alternates" for alternates affecting the work of this Section.
 - 2. Section 072726 "Fluid Applied Air Barrier Coatings" for moisture control.
 - 3. Section 079200 "Joint Sealants" for moisture control.
 - 4. Section 084113 "Aluminum Framed Entrances and Storefronts" for framing information.

1.2 DEFINITIONS

- A. Definitions in ASTM E 2110 apply to Work of this Section.
- B. EIFS: Exterior insulation and finish system(s).
- C. IBC: International Building Code.
- D. Polymer-Based Exterior Insulation and Finish System: Class PB EIFS, as defined in ASTM E 2568.

1.3 SYSTEM DESCRIPTION

- A. Class PB EIFS: A non-load-bearing, exterior wall cladding system that consists of an insulation board attached adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; and a textured protective finish coat.

1.4 PERFORMANCE REQUIREMENTS

- A. EIFS Performance: Comply with the following:
 - 1. Bond Integrity: Free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
 - 2. Weather Tightness: Resistant to water penetration from exterior into water-drainage EIFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish, and including a means that allows water entering into an EIFS assembly to drain to the exterior.
- B. Class PB EIFS: Provide EIFS having physical properties and structural performance that comply with the following:
 - 1. Abrasion Resistance: Sample consisting of 1-inch- thick EIFS mounted on 1/2-inch- thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested per ASTM D 968, Method A.
 - 2. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
 - 3. Accelerated Weathering: Five samples per ICC-ES AC235 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 155.
 - 4. Freeze-Thaw: No surface changes, cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination, or indications of delamination between components when viewed under 5 times magnification after 10 cycles per ICC-ES AC235.

5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch clean glass substrate, cured for 28 days, and showing no growth when tested per ASTM D 3273 and evaluated according to ASTM D 3274.
6. Salt-Spray Resistance: No deleterious affects when tested according to ICC-ES AC235.
7. Tensile Adhesion: No failure in the EIFS, adhesive, base coat, or finish coat when tested per ICC-ES AC235.
8. Water Penetration: Sample consisting of 1-inch- thick EIFS mounted on 1/2-inch- thick gypsum board, cured for 28 days, and showing no water penetration into the plane of the base coat to expanded polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft. of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02.
9. Water Resistance: Three samples, each consisting of 1-inch- thick EIFS mounted on 1/2-inch- thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
10. Impact Resistance: Sample consisting of 1-inch- thick EIFS when constructed, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following:
 - a. Standard Impact Resistance: 25 to 49 inch-lb, where system is 8 feet above adjacent finished grade.
 - b. Medium Impact Resistance: 50 to 89 inch-lb, where system is 8 feet or less above adjacent finished grade.
11. Structural Performance Testing: EIFS assembly and components shall comply with ICC-ES AC235 when tested per ASTM E 330.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type and component of EIFS indicated.
- B. Shop Drawings: Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details including mechanical fasteners, and connections and attachments to other work.
- C. Samples for Initial Selection: For each type of finish-coat color and texture indicated.
- D. Samples for Verification: 12-inch- square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including an aesthetic reveal and a typical control joint filled with sealant of color selected.
 1. Include sealants Samples to verify color selected.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Manufacturer Certificates: Signed by manufacturers certifying that EIFS comply with requirements.
 1. Accessory products installed with EIFS, including joint sealants, flashing, water-resistive coatings, and trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.
- C. Submit a copy of the manufacturer's installation details and application instructions
- D. Field quality-control reports and special inspection reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For EIFS to include in maintenance manuals.
- B. Submit a copy of the Exterior Insulation and Finish System manufacturer's standard warranty.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An installer shall have minimum five (5) years experience who is certified in writing by EIFS manufacturer as qualified to install manufacturer's system using trained workers.

- B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with system components.
 - 1. Air barrier coating specified under Section 072729 "Fluid Applied Air Barrier Coatings" must be obtained from same source as air barrier component of EIFS system.
- C. Mockups/Field Sample: Build mockup/field sample to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution and set quality standards for fabrication and installation.
 - 1. Mockup shall represent typical exterior wall areas. Mockups shall be 4'-0" wide by 6'-0" high by full depth.
 - 2. Apply EIFS to demonstrate surface preparation, water resistive coating application, joint treatments, application of insulation and EIFS coatings, associated flashing and transitions, sealing of expansion joints, terminations, ties-ins and terminations at openings, and penetrations of EIFS assembly.
 - 3. Coordinate application of EIFS to mockups to permit inspection by Architect and EIFS manufacturer's representative of each system component.
 - 4. Include building expansion joint and sheet metal flashing at transition between masonry and EIFS.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
- B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
 - 1. Stack insulation board flat and off the ground.
 - 2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Maintain ambient temperatures above 40 deg F for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.11 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, EIFS Installer, EIFS manufacturer's representative, and installers whose work interfaces with or affects EIFS, including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to EIFS system installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special waterproofing details, wall penetrations, openings, and condition of other construction that affect EIFS.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for EIFS during and after installation.

8. Review procedures for repair of EIFS damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.12 COORDINATION

- A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant sheathing paper, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing that is behind water-drainage EIFS.

1.13 WARRANTY

- A. Manufacturer's Special Warranty for EIFS: Manufacturer agrees to repair or replace components of EIFS-clad wall and soffit assemblies that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Bond integrity and weather tightness.
 - b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.
 2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
 - a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
 - b. Insulation installed as part of EIFS including foam build-outs.
 - c. Insulation adhesive.
 - d. EIFS accessories, including trim components and flashing.
 3. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Installer Warranty
 1. EIF system Installer shall provide a separate minimum 1-year warranty for all workmanship related to the proper installation and drainage performance of the EIFS application. Manufacturer shall not be responsible for workmanship associated with the installation of Exterior Insulation and Finish System with Moisture Drainage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide Dryvit -"Outsalation Plus MD" EIFS system or comparable system by one of the following manufacturers meeting the specified product characteristics:
 1. Senergy; Degussa Wall Systems, Inc.
 2. Sto Corp.

2.2 MATERIALS

- A. Compatibility: Provide water-resistive coating, adhesive, fasteners, board insulation, reinforcing meshes, base-and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by EIFS manufacturer for Project.
- B. Water-Resistive Coatings: EIFS manufacturer's standard formulation and accessories for use as water-resistive barriers; compatible with substrate and complying with physical and performance criteria of ASTM E 2570.
 1. Water-resistive coatings shall be compatible with air barrier coating system specified in Section 072729.
 2. Water-resistive coatings shall match the product characteristics of air barrier coating system specified in Section 072729.
- C. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.
- D. Liquid Flashing: Manufacturer's standard.

- E. Primer/Sealer: EIFS manufacturer's standard substrate conditioner designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.
- F. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; compatible with substrate; and complying with one of the following:
 - 1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, and polymer-based adhesive specified for base coat.
 - 2. Factory-mixed non-cementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.
- G. Molded, Rigid Cellular Polystyrene Board Insulation: Comply with ASTM C 578, Type I; EIFS manufacturer's requirements; and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
 - 1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.
 - 2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
 - 3. Dimensions: Provide insulation boards not more than 24 by 48 inches and in thickness indicated but not more than 4 inches thick or less than thickness allowed by ASTM C 1397.
 - 4. Foam Shapes: Provide with profiles and dimensions indicated on Drawings.
 - 5. At Contractor's option, pre-manufactured insulation starter strips may be used. Starter strips shall have 3 to 4 inch high pre-wrapped and reinforced edges. Starter strips shall not be less than 8 inches tall. Provide in manufacturer's standard lengths.
- H. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. per EIMA 105.01; complying with ASTM D 578 and the following:
 - 1. Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
 - 2. Intermediate-Impact Reinforcing Mesh: Not less than 12.0 oz./sq. yd.
 - 3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd.
 - 4. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd.
 - 5. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd.
- I. Base-Coat Materials: EIFS manufacturer's standard mixture complying with one of the following requirements:
 - 1. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
 - 2. Factory-mixed non-cementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.
- J. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
- K. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating with enhanced mildew resistance complying with the following:
 - 1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
 - 2. Textures: As selected by Architect from manufacturer's full range. Intent is to match Architect's sample.
 - 3. Colors: As selected by Architect from manufacturer's full range. Intent is to match Architect's sample.
- L. Water: Potable.
- M. Mechanical Fasteners: When recommended by manufacturer to supplement adhesive, provide EIFS manufacturer's standard corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated; capable of pulling fastener head below surface of insulation board; and of the following description:
 - 1. For attachment to masonry and concrete substrates, provide sheathing dowel in form of a plastic wing-tipped fastener with thermal cap, sized to fit insulation thickness indicated and to penetrate substrate to depth required to secure anchorage.
 - 2. For attachment, provide manufacturer's standard fasteners suitable for substrate.

- N. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.
1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
 2. Weep Screed/Track: Prefabricated, one-piece type for attachment behind insulation with perforated face leg extended to form a drip and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
 - a. Omit weep screed/starter track where pre-wrapped reinforced starter strips are used.
 3. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.
 4. Window Sill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.

2.3 MIXING

- A. General: Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

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 EIFS.
- B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Begin coating application only after surfaces are dry.
 2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.
- C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.
- D. Resurfacing Existing EIFS Surfaces: Contractor shall follow manufacturer's written recommendations for surface preparation to achieve optimum bond for additional insulation and/or additional surface treatment as indicated on Drawing and Specifications.

3.3 EIFS INSTALLATION, GENERAL

- A. Comply with EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 SUBSTRATE PROTECTION APPLICATION

- A. Primer/Sealer: Apply over each type of substrate encountered and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
- B. Water-Resistive Coating: Apply over sheathing to provide a water-resistive barrier.
 - 1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.
- C. Flexible-Membrane Flashing: Install over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where required by EIFS manufacturer. Prime substrates if required and install flashing to comply with EIFS manufacturer's written instructions and details.
- D. Liquid Flashing: Install over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where required by EIFS manufacturer. Prime substrates if required and install flashing to comply with EIFS manufacturer's written instructions and details.

3.5 TRIM INSTALLATION

- A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at window sills, and elsewhere as indicated, according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.
 - 1. Weep Screed/Track: Use at bottom termination edges, at window and door heads of water-drainage EIFS unless otherwise indicated.
 - a. Omit weep screed when pre-manufactured starter strips are used.
 - 2. Window Sill Flashing: Use at windows unless otherwise indicated.
 - 3. Expansion Joint: Use where indicated on Drawings.
 - 4. Casing Bead: Use at other locations.

3.6 INSULATION INSTALLATION

- A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397, EIFS manufacturer's written instructions to accommodate water drainage installation, and the following:
 - 1. Where vertical ribbons of adhesive are used, apply adhesive to insulation or to air barrier coating according to EIFS manufacturer's written instructions. Apply adhesive to a thickness recommended by EIFS manufacturer.
 - 2. Press insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
 - 3. Allow adhered insulation to remain undisturbed for period recommended by EIFS manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
 - 4. Apply insulation over air barrier coating and dry substrates in courses with long edges of boards oriented horizontally.
 - 5. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
 - 6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches wide or 6 inches high. Offset joints not less than 6 inches from corners of window and door openings and not less than 4 inches from aesthetic reveals.
 - a. Adhesive Attachment: Offset joints of insulation not less than 6 inches from horizontal and 4 inches from vertical joints in sheathing.
 - 7. Place insulation with adhesive strips and channels, slots, or waves aligned in the vertical position for drainage
 - 8. Interlock ends at internal and external corners.
 - 9. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
 - 10. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
 - 11. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/16 inch from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper

- than 1/16 inch.
12. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch.
 13. Interrupt insulation for expansion joints where indicated.
 14. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
 15. After installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches over front and back face unless otherwise indicated on Drawings.
 16. Treat exposed edges of insulation as follows:
 - a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
 - b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
 - c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
 17. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-/weather-resistive barrier.
- B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
1. At expansion joints in substrates behind EIFS.
 2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
 3. Where wall height or building shape changes.
 4. Where EIFS manufacturer requires joints in long continuous elevations.

3.7 BASE-COAT INSTALLATION

- A. Base Coat: Apply to exposed surfaces of insulation in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch dry-coat thickness.
- B. Reinforcing Mesh: Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
1. Standard-impact reinforcing mesh for installations 8 feet above adjacent finished grade.
 2. Intermediate-impact reinforcing mesh for installations 8 feet or less above adjacent finished grade.
- C. Double-Layer Reinforcing Mesh Application: Where indicated, apply second base coat and second layer of standard or intermediate-impact reinforcing mesh, overlapped not less than 2-1/2 inches or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions in same manner as first application. Do not apply until first base coat has cured.
- D. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches beyond perimeter. Apply additional 9-by-12-inch strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches on each side of corners.
1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches wide.
 2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

3.8 FINISH-COAT INSTALLATION

- A. Primer: When recommended by EIFS manufacturer, apply over dry base coat according to EIFS manufacturer's written instructions.
- B. Finish Coat: Apply over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
1. Textures: Match approved sample.

2. Colors: Match approved sample.

3.9 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. According to ICC-ES AC24 or ICC-ES AC235 as applicable.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections other than "Special Inspections" when required by EIFS manufacturer and authority having jurisdiction.
- C. EIFS Tests and Inspections: For the following:
 1. According to requirements of authority having jurisdiction and EIFS manufacturer.
- D. Remove and replace EIFS where test results indicate that EIFS do not comply with specified requirements.
- E. Prepare test and inspection reports.

3.10 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 072419

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SECTION 072500 - WEATHER BARRIERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building Wrap Weather Barriers (072500.A01).
 - 2. Self-adhering weather barrier (072500.A02).
 - 3. Flexible Flashing (072500.A03).
 - 4. Drainable Weather Barriers (072500.A04).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For self-adhering building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: For weather-barrier assemblies.
 - 1. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier, from ICC-ES.
 - 1. Weather resistive barrier shall meet ICC-ES AC308 "Acceptance Criteria for Water Resistive Barriers".

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 PRODUCTS

2.1 WATER-RESISTIVE BARRIER (072500.A02).

- A. Basis-of-Design Products: Provide weather resistive barrier as a complete system, including but not limited to; self-adhering building wrap, self-adhering flashing, reinforced liquid flashing, tape and sealants. Subject to compliance with requirements, provide one of the following:
 - 1. VaproShield LLC; "VaproShield WrapShield SA".
 - 2. Henry Company; "BlueskinVP 160".
 - 3. Cosella-Dorken; "Delta-Vent SA".
 - 4. Comparable substitute meeting specified requirements, and which is submitted to and accepted by Architect prior to bidding.
- B. Performance Characteristics:
 - 1. Water-Vapor Permeance: Not less than 29 perms per ASTM E 96/E 96M, Method B.
 - 2. Air Leakage: Not greater than 0.004 CFM/sqft at 1.57 lbs/sqft when tested in accordance with ASTM E2178.
 - 3. Thickness shall not be less than 0.023 inches.
 - 4. Allowable UV Exposure Time: Not less than three months.
 - 5. Fire Performance Characteristics: Class A when tested in accordance with ASTM E 84.

2.2 MISCELLANEOUS MATERIALS

- A. General: Accessory materials recommended by weather-barrier manufacturer to produce a complete assembly and compatible with primary weather-barrier material
- B. Flexible Flashing: Weather resistive barrier manufacturer's standard composite, self-adhesive, flashing product.
- C. Liquid Flashing: Weather resistive barrier manufacturer's standard composite, liquid flashing and reinforcing mesh.
- D. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.
- E. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 EXECUTION

3.1 EXAMINATION AND SURFACE PREPARATION

- A. General: Examine and prepare surfaces to receive self-adhering building wrap/weather barrier in strict accordance with barrier manufacturer's written instructions, and as follows:
 - 1. All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar and other contaminants detrimental to adhesion of barrier membrane and flashings.
 - 2. Remove fins, ridges, mortar, and other projections.
 - 3. 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.

3.2 WATER-RESISTIVE BARRIER INSTALLATION

- A. General: Install weather-barrier and accessory materials according to manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous weather barrier.
 - 1. Apply flashing (liquid and membrane types) to comply with manufacturer's written instructions.
- B. Where recommended by weather barrier manufacturer, apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 1. Where indicated, cover exposed exterior surface of sheathing indicated to receive metal fascia with water-resistive barrier securely adhered to sheathing as occurs. Stagger all end lap seams.
- C. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap.
 - 3. Lap over adjacent construction and adhere to substrate. Cut back weather resistive barrier so it will not be exposed to view and will allow for edge of barrier to be covered with sealant.
 - 4. Install weather barrier and auxiliary materials to lap and seal to adjacent waterproofing and air barrier coating as occurs, to provide continuity of building envelope barrier
- D. At end of each working day, seal top edge of weather barrier to substrate with termination mastic.
- E. Openings: Prime concealed, perimeter frame surfaces of windows, storefronts, and doors. Apply transitions and flashing (liquid or membrane) so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of weather-barrier material with flexible low-rise foam sealant.
- G. Seal top of through-wall flashings to weather barrier. Provide termination bar as recommended by weather barrier manufacturer.

- H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- I. Repair punctures, voids, and deficient lapped seams. Slit and flatten fishmouths and blisters. Extend patches 6 inches beyond repaired areas.
- J. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500

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SECTION 072726 - FLUID APPLIED AIR BARRIER COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Vapor-retarding, fluid-applied air barriers (072726.A01).
 - 2. Transition (Detail) Membrane (072726.A03).
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for masonry to receive air barriers.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for flexible membrane closures installed with air barriers.

1.2 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 accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at Project site.
 - 1. Contractor to organize and convene conference a minimum of two weeks prior to commencing Work of this Section.
 - 2. Agenda shall include, at a minimum, the following:
 - a. Construction and visual inspection of mock-up.
 - b. Sequence of construction.
 - c. Coordination with substrate preparation.
 - d. Materials approved for use.
 - e. Compatibility of materials.
 - f. Coordination with installation of adjacent and covering materials.
 - g. Details of construction.
 - h. Review of inspection, testing, protection and repair procedures
 - i. Construction site safety will be discussed to review hazards or fire risks during application.
 - 3. Attendance is required by air barrier coating manufacturer's representative, air barrier coating installer, representatives of related trades including covering materials, substrate materials and adjacent materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; tested physical and performance properties of products.
 - 2. Include verification data, including graphic illustrations, listing each component of the assembly passing NFPA 285 testing.
 - 3. Submit product data for air barrier coatings concurrently with product data for polyisocyanurate insulation.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air barrier. Include details for each type of substrate showing: substrate joints and cracks, through-wall flashing, counterflashing, each type of penetration, inside and outside corners, terminations, expansion joints, air barrier flashing system at openings and tie-ins with adjoining construction.
 - 2. Include details of interfaces with other materials that form part of air barrier.

3. Show and list each component of the assembly.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of manufacturer-certified installers and supervisors employed by the Installer, who work on Project, in addition to the following:
 1. Submit in writing, evidence of experience.
- 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: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, in addition to the following:
 1. Installer shall have not less than 5 years successful experience, under the current company name, in installing fluid-applied membrane air barriers of similar type, size and complexity as those specified for this Project.
 2. Installer shall submit a reference list, complete with Owner, Architect, General Contractor or Construction Manager; phone number of each, of at least seven (7) completed projects in the states of Missouri and Kansas similar in size and specification.
 - a. List shall include square footage installed on each project.
 - b. List shall include type of air barrier installed, name of product installed and name of manufacturer.
 3. Installer shall assign experienced mechanics from previous applications, including lead mechanic/supervisor, for this Project.
- C. Field Mockups: Build mockups to set quality standards for materials and execution.
 1. Apply air barrier coating to mockup panels specified in Section 042000 "Unit Masonry", to demonstrate surface preparation, crack and joint treatment, application of air barriers and associated flashing and transitions, and sealing of gaps, terminations, ties-ins and terminations at openings, and penetrations of air-barrier assembly.
 2. Coordinate application to mockups to permit inspection by Architect and air barrier coating manufacturer's representative of air barrier before external insulation and cladding are installed.
 - a. Include junction building corner condition, building expansion joint and sheet metal flashing.
 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.
- D. Testing Agency: Contractor shall engage an independent testing agency to perform testing as indicated in the work of this Section.

1.7 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.
- C. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

- D. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- E. Protect fluid-applied membrane components from freezing and extreme heat.
- F. Sequence deliveries to avoid delays but minimize on-site storage.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended 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.
 - 3. Do not apply product or accessories over incompatible materials.

1.9 WARRANTY

- A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.
 - 1. Failures for non-permeable air barrier system include, but are not limited to, the following:
 - a. Failure to maintain air permeance rating not to exceed 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178, within specified warranty period.
 - b. Failure to maintain a vapor permeance rating no greater than 1 perms when tested in accordance with ATM E96, Method B.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS – GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. VOC Content: 100 g/L or less.
- C. Low-Emitting Materials: Products 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."

2.2 PERFORMANCE REQUIREMENTS

- A. Vapor Retarding Fluid-Applied Air Barrier - General: Air barrier shall be capable of performing as a continuous vapor-retarding 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, 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., when tested according to ASTM E 2357.
- C. Exterior wall assemblies incorporating the product and accessories shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.
- D. Air barrier system shall be tested for various fastener attached penetrations including, but not limited to, veneer anchors.

- E. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
1. Foundation and walls.
 2. Walls and windows or doors.
 3. Different wall systems.
 4. Wall and roof.
 5. Wall and roof over unconditioned space.
 6. Walls, floor and roof across construction, control and expansion joints.
 7. Walls, floors and roof to utility, pipe and duct penetrations.
- F. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

2.3 VAPOR-RETARDING FLUID-APPLIED AIR BARRIER

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier (072726.A01): Fire- resistant, synthetic polymer membrane.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings and Waterproofing (CCW); "Fire-Resist BarriTech NP."
 - b. Henry Corporation; "Air-Bloc 32 MR."
 - c. W. R. Meadows; "Air-Shield LSR."
 - d. Tremco; "ExoAir 130."
 - e. Comparable products from other manufacturers meeting specified requirements, and that are submitted to and accepted by Architect prior to bidding.
 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Water Vapor Permeance: Maximum 1 perm; ASTM E 96/E 96M (Method B).
 - c. Ultimate Elongation: Minimum 346 percent; ASTM D412, Die C.
 - d. Surface Burning Characteristics:
 - 1) Flame Spread Index of 25 or less; ASTM E 84.
 - 2) Smoke Generation Index of 450 or less; ASTM E 84.
 - e. Low Temperature Flexibility: No cracking at minus 20 degrees F, 180 degree bend over 1-inch mandrel.
 - f. Fastener Sealability: No water leaking through nail penetration after 24 hours; ASTM D 1970.
 - g. UV Exposure Rating: Coating may be exposed up to 180 days (6 months) without effecting warranty.
 - h. Multi-Story Fire Tests: Air barrier coating shall pass NFPA 285.

2.4 VAPOR-PERMEABLE FLUID-APPLIED AIR BARRIER

- A. Vapor-Permeable Fluid-Applied Air Barrier (072726.A02): Fire- resistant, synthetic polymer membrane.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings and Waterproofing (CCW); "Fire-Resist BarriTech VP."
 - b. Henry Corporation; "Air-Bloc 31 MR."
 - c. W. R. Meadows; "Air-Shield LMP."
 - d. Tremco; "ExoAir 230."
 - e. Comparable products from other manufacturers meeting specified requirements, and that are submitted to and accepted by Architect prior to bidding.
 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Water Vapor Permeance: Minimum 10 perm; ASTM E 96/E 96M (Method B).
 - c. Surface Burning Characteristics:
 - 1) Flame Spread Index of 25 or less; ASTM E 84.
 - 2) Smoke Generation Index of 450 or less; ASTM E 84.
 - d. Low Temperature Flexibility: No cracking at minus 20 degrees F, 180 degree bend over 1-inch mandrel.

- e. Fastener Sealability: No water leaking through nail penetration after 24 hours; ASTM D 1970.
- f. UV Exposure Rating: Coating may be exposed up to 180 days (6 months) without effecting warranty.
- g. Multi-Story Fire Tests: Air barrier coating shall pass NFPA 285.

2.5 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete fire-resistant air-barrier assembly and compatible with primary air-barrier material.
- B. Transition Membrane and Flashing (072726.A03): Provide self-adhering sheet or reinforced liquid flashing as recommended by air-barrier material manufacturer. Approved with air barrier membrane in NFPA 285 wall assemblies.
 - 1. Basis-of-Design Products for Transition Membrane: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings and Waterproofing; "CCW Sure-Seal Pressure-Sensitive Elastoform".
 - 1) Self -Adhering Sheet Product Information: Fully-adhered laminated, flexible, synthetic rubber flashing
 - (a) Thickness: 0.090 inch (90 mil) thickness
 - (b) Water Vapor Permeance: 0.06 Perm (ASTM E96 B)
 - b. Henry Corporation: "Air-Bloc 16 MR".
 - 1) Flued Applied Vapor, Impermeable - Product Info:
 - (a) Water Vapor Permeance: (ASTM E96, B): 0.03 PERM (ASTM E96 B).
 - (b) Tensile Strength (ASTM D412): 100 psi.
 - (c) Elongation (ASTM D412): 270%.
 - (d) Puncture Resistance (ASTM E154): 40 LBF.
 - (e) Application Temp: -40 °F to +180 °F
 - (f) Air Leakage Test Per ASTM E 283.
 - (g) Meets NFPA 285.
 - c. W. R. Meadows; "Air-Shield".
 - 1) Self -Adhering Sheet Product Information: Cross-laminated polyethylene bonded to specially modified asphalt
 - (a) Thickness: 40 mil thickness.
 - (b) Water Vapor Permeance (ASTM E96, B): 0.035 PERM (ASTM E96 B).
 - (c) Tensile Strength (ASTM D412): 4000 psi.
 - (d) Elongation (ASTM D412): 400 MIN.
 - (e) Puncture Resistance (ASTM E154): 40 LBF.
 - (f) Application Temp: 40° F Min, LOW TEMP version available at 20° F.
 - (g) Air Leakage Test Per ASTM E 283.
 - d. Tremco; "Proglaze ETA".
 - 1) Sheet - Product Information: Pre-engineered silicone material used as a transition assembly between the window or wall system and adjacent air and vapor barrier materials.
 - (a) Tensile Strength (ASTM D412): 1130 psi.
 - (b) Elongation (ASTM D412): 400 MIN., 550%
 - (c) Tear Strength (ASTM D624): 40 LBF.
 - (d) Application Temp: Low Temp -40° F Min.
 - e. Comparable products from other manufacturers listed.
 - f. Comparable products from other manufacturers not listed, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
 - 2. Basis-of-Design Products for Detail Flashing: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings and Waterproofing; "Fire-Resist 705 FR-A."
 - b. Comparable products from other manufacturers listed.
 - c. Comparable products from other manufacturers not listed, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
- C. Contact Adhesive: As approved by air-barrier manufacturer.
- D. Primer: Liquid primer as approved by air-barrier manufacturer for substrates involved.
- E. Detail Mastic: As approved by air-barrier manufacturer.
- F. Joint Reinforcing Fabric: Air-barrier manufacturer's woven, synthetic polymer reinforcement fabric.

- G. Joint Reinforcing Strip: Air-barrier manufacturer's self-adhering glass-fiber-mesh tape.
- H. Glass Mat: Randomly-oriented glass strands held in binder soluble in wet air barrier membrane.
 - 1. As approved by air-barrier manufacturer.
- I. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- J. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.
- K. Sprayed Polyurethane Foam Sealant: Class 1, one- or two-component, disposable, closed-cell, low-pressure spray foam insulation/sealant kits. Spray foam shall be flame retardant and have a nominal 2.0-lb/cu. ft density; 95 percent minimum closed cell content and shall meet ASTM E 84 requirements flame-spread index of 25 or less and a smoke developed rating of 300 or less based on 2 inch thickness. Provide insulation manufacturer's recommended primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- L. Joint Sealant:
 - 1. Dow 790, 791, 795.
 - 2. Pecora 890, 891, 895.
 - 3. GE Silpruf, Silpruf LM.
 - 4. Other product approved by air barrier membrane manufacturer.

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 concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263. Honeycomb and holes/cracks exceeding ¼ inch across shall be filled with grout or mortar.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
 - 5. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the air barrier installation.
 - 6. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all screws with liquid flash to ensure recessed screws holes are filled. Gaps greater than 6mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system.
- C. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.
- D. Clean, prepare, treat, and seal substrate and substrate joints according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- E. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

- F. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- G. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- H. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- I. Fill cracks, gaps and joints exceeding ¼ inch width with fill compound or sealant approved by air barrier manufacturer. Fill rough gaps around pipe, conduit and similar penetrations with mortar, non-shrink grout, fill compound or polyurethane foam sealant shaved flush.
- J. At changes in substrate plane, apply sealant or termination mastic beads to create a cant at sharp corners and edges to form a smooth transition from one plane to another.
- K. 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.

3.3 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
 - 1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air-barrier coating material and embed joint reinforcing in preparation coat.
- B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of air-barrier coating material at joints. Tape joints with joint reinforcing after first layer is dry. Apply a second layer of air-barrier coating material over joint reinforcing.
- C. Plywood Sheathing: Fill joints and apply air-barrier coating in strict accordance with air-barrier coating manufacturer's written instructions to suit substrate involved.

3.4 TRANSITION STRIP AND FLASHING INSTALLATION

- A. General: Install strips, transition strips, flashing, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 - 1. Coordinate the installation of air barrier with installation of sheet metal flashing and embedded masonry through-wall flashing to ensure continuity of air barrier and drainage to exterior.
 - 2. Install transition strip between changes in substrates and base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
 - 3. Vertical legs of metal flashings installed over fluid applied air barrier coatings shall receive transition strips and fluid applied flashings, installed as recommended by manufacturers written recommendations.
- B. Apply primer to substrates, when required by air barrier coating manufacturer, at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier coating material on same day. Re-prime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum and plywood sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
 - 2. Where required by air barrier coating manufacturer to achieve performance specified, apply manufacturer's recommended filler coat over CMU and similar substrates.
- C. 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. Extend flashing/transition membrane into window and other openings to completely cover wood blocking and nailers in accordance with air barrier coating manufacturer's recommendations and approved shop drawings.

- D. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- E. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- F. 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.
- G. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- H. 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 beyond repaired areas in strip direction.

3.5 INSTALLATION

- A. General: Install fluid-applied membrane air-barriers and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier/moisture barrier. Apply air-barrier coating within manufacturer's recommended application temperature ranges.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier.
 - 2. Coordinate the installation of air barrier with installation of weather barrier and jamb closure membranes to ensure compatibility and continuation of barriers to allow water to drain to exterior.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Vapor Retarding Fluid-Applied Membrane Material: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by air barrier manufacturer to meet performance requirements specified and as listed in Air Barrier Association of America (ABAA) for air permeance and water vapor permeance (desiccant method), but not less than 40-mil dry film thickness.
 - a. Apply additional coats as needed to achieve void- and pinhole-free surface.
 - 2. Extend system into window and door openings of metal-stud-framed walls.
- D. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer's written instructions.
- E. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- F. Repair punctures, voids, and deficient lapped seams. Slit and flatten fishmouths and blisters. Extend patches 6 inches beyond repaired areas, unless otherwise recommended by air barrier manufacturer.
- G. Do not cover air barrier until it has been inspected by air barrier coating manufacturer's representative and installation has been reviewed and accepted by Architect.
- H. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Air barrier coating manufacturer shall perform tests and inspections.

- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include, and is not limited to, the following:
 - 1. Continuity of air-barrier system has been achieved with no gaps or holes.
 - 2. Continuous support of air-barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 4. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 5. Surfaces have been primed, if applicable.
 - 6. 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.
 - 7. Termination mastic has been applied on cut edges.
 - 8. Flashing strips, transition strips and liquid flashing have been firmly adhered to substrate.
 - 9. Compatible materials have been used.
 - 10. Transitions at changes in direction and structural support at gaps have been provided.
 - 11. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 12. All penetrations have been sealed.
- C. Tests:
 - 1. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. according to ASTM D 4541 for each 1000 sq. ft. 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.

3.7 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 required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane 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 by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

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SECTION 074400 - CONCRETE FACED RIGID INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete faced insulated perimeter wall panels (074400.A01).
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for foundation insulation and foam void fill.
 - 2. Section 042000 "Unit Masonry" for foamed-in-place masonry cell foam insulation.

1.2 ACTION SUBMITTALS

- A. 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.
- B. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.3 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.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provides design, engineering, fabrications and testing of all required components and assemblies for a complete system.
- B. Mock-Up/Field Sample: Provide a mock-up/field sample for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship is approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.
 - 4. Subject to compliance with requirements, mock-up/field samples may remain as a part of the completed work, if acceptable to Architect and Owner.

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.

4. Store panels laying flat
 5. Do not drop panels.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 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 recommended limits.

PART 2 PRODUCTS

2.1 CONCRETE FACED INSULATED PERIMETER WALL PANELS (074400.A01)

- A. Basis of Design Product: Subject to compliance with requirements, provide "WallGUARD Concrete Faced Insulated Perimeter Panels" by T-Clear / FinPan or a comparable product, the following product characteristics, submitted to and accepted by Architect prior to bidding.
1. Construction: Perimeter Foundation Insulation: Extruded polystyrene board to ASTM C 578 (CAN/ULC-S701) Type IV, rigid, closed cell, with integral high-density skin, c/w integral 5/16 inch (8 mm) thick latex-modified concrete facing.
 - a. Board Size: 2 feet by 4 feet by 2-5/16 inches and 3-5/16 inches thick.
 - b. Edges: Tongue and groove sides, square edge ends.
 - c. Maximum Use Temperature: 165-degree F.
 - d. Thermal Resistance (ASTM C 518): Long term aged R-value of 5 per inch.
 - e. Foam Compressive Strength, ASTM D 1621, minimum: 35 psi.
 - f. Compressive Strength: to ASTM D 1621, minimum 40 psi.
 - g. Water Absorption (ASTM D 2842): < 0.1 (0.7% by volume maximum).
 - h. Water Vapor Permeance (ASTM E 96): 0.8 perms.
 - i. Coefficient of Lineal Thermal Expansion (ASTM D 696, in/in x degree F (mm/m x degree C)): 3.5 x 10-5 (6.3 x 10-2).
 2. Accessories:
 - a. Metal Cap Flashing: 24 ga (0.61mm) galvanized steel J-channel; 2-1/4 inches wide, 4 inches long leg and 2-1/4 inches short leg; prefinished in color as selected.
 - b. Clips and Fasteners: corrosion-resistant type, sized to suit application as supplied by insulation manufacturer.
 3. Wall Panel System Fire Test:
 - a. Meets Uniform Building Code (UBC) 17-5 - Room Fire Test Standard for Interior of Foam Plastic Systems. Criteria are to maintain coverage of foam substrate up to 8 feet (2438 mm) from interior corner, over the duration on the test.
 - b. Equivalent to current UL 17-15 and UBC 97 revised.

2.2 ACCESSORIES

- A. 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. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 2. Adhesives shall be compatible with fluid-applied air barrier coating specified in Section 072726.
 3. Adhesives shall have a VOC content of 70 g/L or less.
 4. 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."

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 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.
- 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, 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.

3.4 INSTALLATION OF CONCRETE FACED INSULATED PERIMETER WALL PANELS

- A. Perimeter Insulation Substrate Examination (Poured Concrete or Concrete Block Only):
 - 1. Verify that the insulation boards and adjacent materials are compatible.
 - 2. Verify that the substrate is flat, sound, clean and remove any masonry irregularities or jagged surfaces on the foundation wall.
- B. Perimeter Insulation Installation:
 - 1. Layout concrete-faced insulation boards to maximize board sizes. Do not use boards less than 6 inches wide.
 - 2. Install concrete-faced insulation board system in orientation as indicated or to maximize full sheets. Complete with fastening clips and cap flashing in accordance with manufacturer's installation guidelines.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 074400

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formed Products:
 - a. Formed roof drainage sheet metal fabrications.
 - b. Formed wall sheet metal fabrications.
 - c. Formed equipment support flashings.
 - d. Premanufactured pitch pockets.
- B. Related Sections:
 - 1. Section 012300 "Alternates" for those alternates affecting work of this Section.
 - 2. Section 042000 "Unit Masonry" for masonry through wall flashing.
 - 3. Section 061000 "Rough Carpentry " for wood nailers, curbs, and blocking.
 - 4. Section 074219 "Exterior Insulation and Finish System (EIFS)" for sheet metal flashing and trim integral with EIFS.
 - 5.

1.2 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 non-corrosive installation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct Conference at Project Site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs and condition of other construction that affects sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates, if applicable.
 - 4. Review sheet metal flashing observation and repair procedures – post flashing installation.
 - 5. Meet with Owner, Architect, Installer and other Installers whose work interfaces with or affects sheet metal flashing and trim – including installers of roofing materials, roof accessories and roof-mounted equipment.
 - 6. Review methods and procedures related to sheet metal flashing and trim.
 - 7. Review special roof details, roof drainage, roof penetrations, equipment curbs and condition of other construction that will affect sheet metal flashing.
 - 8. Review sequencing of sheet metal flashing installation with other related trades to coordinate installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of records to each participant.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashing as applicable.
 6. Details of special conditions and of connections to adjoining work.
 7. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.
 8. Include details of roof-penetration flashing.
 9. Include details of expansion joints and expansion-joint covers – show direction of expansion and contraction joints from fixed points.
- C. Samples for Verification: For each type of exposed finish required, prepared on 6 inch square samples of actual metal to be used in the work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- C. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that 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 compliant, shop shall be SPRI ES-1 certified and listed as able to fabricate required details as tested and approved.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual", Sixth Edition, unless more stringent requirements are specified or shown on Drawings.

1.7 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 the extent necessary for the period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which 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.
 - 1. Sheet metal flashings shall be installed in accordance with ANSI/SPRI/FM 4435/ES-1 "Wind Design Standard for Edge Systems used with Low Slope Roofing Systems" as applicable for locations and configurations indicated on Drawings.
- 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. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- D. 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, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
 - 1. Contractor shall use gauges or thicknesses specified or as prescribed in the referenced standards for specific girths, whichever is greater.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 - 1. Finish: 2D (dull, cold rolled).
 - 2. Surface: Smooth, flat.
- C. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 - 2. Surface: Smooth, flat.
 - 3. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. 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. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 4. Colors: As selected by Architect from manufacturer's full range. Refer to Exterior Finish Legend for color matching requirements for sheet metal flashing and trim installed adjacent to metal wall panels, storefront and curtain wall.
 - 5. 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.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet (076200.A01): Minimum 30 to 40 mils () 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 and compatible with self-adhering air barrier transition membrane.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
- B. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.
- C. Flexible Membrane Closure (076200.A04): EPDM Sheet membrane; at roof expansion joints provide non-reinforced flexible, black EPDM synthetic rubber sheet flashing of 45 to 60 mils thickness. EPDM sheet shall have a tensile strength of not less than 1200 psi, a tear resistance of at least 20 lbs per inch and an ultimate elongation of at least 250 percent. Provide with seam and splice tape, adhesives and all other accessories required for proper and watertight installation.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal 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.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder:
 - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealant Tape (076200.A02): Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant (076200.A03): ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the 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 without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed 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 on slope and location lines as indicated and within 1/8-inch () offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. 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 deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- E. 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.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Do not use graphite pencils to mark metal surfaces.

2.6 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 - 1. Coil-Coated Galvanized Steel: 0.034 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Pre-Finished Miscellaneous Metal Flashing and Trim (076200.A35): Fabricated from the following materials:
 - 1. Coil-Coated Galvanized Steel: 0.034 inch thick.
 - 2. Stainless Steel: 0.031 inch thick.
 - 3. At metal wall panels, fabricate to configurations indicated, with vertical leg not less than 4 inches tall to extend up and behind rigid insulation. Fabricate ends of flashing with end dams not less than 2 inches tall, and extending out to face of wall panel.
 - 4. At pan flashing for windows, storefront and curtain wall; fabricate to configurations indicated, with horizontal leg to extend 2 inches beneath window, storefront or curtain wall sill as occurs.
 - 5. Fabricate trim to configurations indicated.
 - 6. Fabricate pre-finished miscellaneous metal flashing in lengths of 8 to 10 feet. Overlap adjoining pieces 4 inches and seal joint watertight.

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.

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. For the record, 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 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Self-Adhering High Temperature Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of
- C. underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
- D. Flexible Membrane Closure EPDM Underlayment: Install EPDM underlayment wrinkle free and continuously sealed between sheets and all laps for watertight installation at roof expansion joints to form a bellows. Install an additional sheet over the top of coping, wall caps, and expansion joint bellows securely attached to wall substrate and adhered to over top of blocking/curb and turned down 1-1/2 inches.
- E. 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, welding rods, 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 and levels indicated. 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 apart. Anchor individual cleats with two fasteners and bend tabs over fasteners. At continuous cleats, interlock bottom edge of roof edge flashing with continuous cleat. Anchor continuous cleat to substrate at 2 inches in from each end and then at not greater than 12-inch centers. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. All lap joints in pre-finished miscellaneous metal flashing shall be sealed watertight.
 7. Torch cutting of sheet metal flashing and trim is not permitted.
 8. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of EPDM underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.

- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints as shown and as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, 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.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder metallic-coated steel sheet.
 - 2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inch in direction of water flow. Provide EPDM bellows and EPDM cap flashing beneath expansion joint cover as specified.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as 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, and similar flashings to extend ()4 inches beyond wall openings.

3.5 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. Pre-Finished Miscellaneous Metal Flashing: Coordinate installation of flashing with adjoining construction and air barrier coating. Seal lap joints watertight.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

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.

- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers' written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. 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 076200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
- B. Related Sections:
 - 1. Division 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grace Construction Products.
 - 2. Hilti, Inc.
 - 3. Johns Manville.
 - 4. Specified Technologies Inc.
 - 5. 3M Fire Protection Products.
 - 6. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - 7. USG Corporation.
- B. Single Source Responsibility: All firestopping insulation, sealants, and related firestopping accessories required to prevent the passage of fire and smoke through fire rated penetrations, smoke rated penetrations and joints shall be furnished and installed by (or installed under direct supervision of) one contractor for the entire project. All products used for this work shall be furnished by one manufacturer for the entire project.

2.2 PENETRATION FIRESTOPPING (078413.A01)

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls fire-barrier walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. 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 manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fillers for sealants.

2. Substrate primers.
 3. Collars.
- F. Firestopping compounds shall be paintable or capable of receiving finish materials in areas which are exposed to view and scheduled to receive finishes.

2.3 FILL MATERIALS

- A. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- B. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- D. 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.
- E. 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.
- F. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Firestopping Manufacturer's representative shall perform and inspections of penetration firestopping. Contractor shall notify Architect and manufacturer's representative no later than seven days after penetration firestopping is complete to schedule inspection.
 - 1. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
 - 2. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

END OF SECTION 078413

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SECTION 078446 - FIRE RESISTIVE JOINT SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Joints in or between fire-resistance-rated constructions. (078446.A01).
- B. Related Sections:
 - 1. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Firm shall be experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

PART 2 PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS (078446.A01)

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
 - 1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Grace Construction Products.
 - b. Hilti, Inc.
 - c. Johns Manville.
 - d. Specified Technologies Inc.
 - e. 3M Fire Protection Products.
 - f. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - g. USG Corporation.
- C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
 - 1. Sealant shall have a VOC content of 250 g/L or less.
- D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.
- E. Firestopping compounds shall be paintable or capable of receiving finish materials in areas which are exposed to view and scheduled to receive finishes.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Fire-Resistive Joint System manufacturer's representative will perform inspections of completed installation of work of this Section. Contractor shall notify Architect and manufacturer's representative not later than seven days after completion of fire-resistive joint system installation to schedule inspection.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
- B. Wall-to-Wall, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: WW-S-0000-0999.
 2. Assembly Rating: 2 hours.
 3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class II - 25 percent compression or extension.
 5. L-Rating at Ambient: As selected by Contractor to suit project conditions.
- C. Floor-to-Wall, Fire-Resistive Joint Systems:
 1. UL-Classified Systems: FW-S-0000-0999.
 2. Assembly Rating: 2 hours.
 3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class II - 25 percent compression, extension, or horizontal shear.
 5. L-Rating at Ambient: As selected by Contractor to suit project conditions.
- D. Head-of-Wall, Fire-Resistive Joint Systems (for Fire-Resistive Roof Systems):
 1. UL-Classified Systems: HW-S-0000-0999.
 2. Assembly Rating: 2 hours.
 3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class II - 25 percent compression or extension.
 5. L-Rating at Ambient: As selected by Contractor to suit project conditions.
- E. Head-of-Wall, Fire-Resistive Joint Systems (for Non-Fire-Resistive Roof Systems):
 1. UL-Classified Systems: CJ-S-0000-0999.
 2. Assembly Rating: 2 hours.
 3. Nominal Joint Width: As indicated.
 4. Movement Capabilities: Class II - 25 percent compression or extension.
 5. L-Rating at Ambient: As selected by Contractor to suit project conditions.
- F. Perimeter Fire-Resistive Joint Systems:
 1. UL-Classified Perimeter Fire-Containment Systems: CW-S-0000-0999.

2. Integrity Rating: 2 hours.
3. Insulation Rating: 1 hour.
4. Linear Opening Width: As indicated.
5. Movement Capabilities: Class II - 25 percent compression or extension.
6. L-Rating at Ambient Temperature: As selected by Contractor to suit project conditions.

END OF SECTION 078446

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SECTION 079200 - JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.
 - 4. Polyurea joint sealants.
 - 5. Hybrid silicone sealants.
- B. Related Sections:
 - 1. Section 078413 "Penetration Firestopping" for sealing penetrations in fire-resistance-rated construction.
 - 2. Section 078446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
 - 3. Section 088000 "Glazing" for glazing sealants.
 - 4. Section 092900 "Gypsum Board" for acoustical sealant and sealing acoustical joints.
 - 5. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each application indicated below:
 - a. Each kind of sealant and joint substrate in exterior walls.
 - b. Sealant around perimeter of exterior windows/storefront.
 - 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 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.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. 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.
- D. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. 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.
- C. Field-Adhesion Test Reports: For each sealant application tested.
- D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
 - 1. Refer to Section 042000 "Unit Masonry" for sealant joint in masonry mockups.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 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 structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content: Sealants and sealant primers shall comply with the following:
 - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - 3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- G. Keynote Designations: Refer to schedule at end of this Section for types and applicable substrates.
 - 1. Sealant: (079200.A01).
 - 2. Sealant with backer rod: (079200.A02).
 - 3. Acoustical sealant: (079200.A04): Refer to Section 092900.
 - 4. Tape Sealant (079200.A05).

2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Non-Staining, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50 minimum, for Use NT.
 - 1. Products:
 - a. Tremco Incorporated; Spectrem 2.
 - b. Sika Products; Sikasil WS-295 FPS.
 - c. Dow; Dowsil 756 SMS Building Sealant.
 - d. Pecora; 890NST.
- B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
 - 1. Products:
 - a. Dow; Dowsil 790 Silicone Building Sealant.
 - b. Sika Products; Sikasil 728 NS.
 - c. Pecora Corporation; 311 NS.
- C. Mildew-Resistant, Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25 minimum, for Use NT.
 - 1. Products:
 - a. Tremco Incorporated; Spectrem 2.
 - b. Sika Products; Sikasil GP.

2.3 URETHANE JOINT SEALANTS

- A. Multicomponent, Non-sag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25 minimum, for Use NT.
 - 1. Products:
 - a. BASF Building Systems; Master Seal NP 2.
 - b. Tremco Incorporated; Dymeric 240FC.
 - c. Sika Products; Sikaflex; 2c NS EZ Mix.
 - d. Pecora Corporation; Dynatrol II.
- B. Multicomponent, Non-sag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25 minimum, for Use T.
 - 1. Products:
 - a. BASF Building Systems; Master Seal NP 2.
 - b. Tremco Incorporated; Dymeric 240FC.
 - c. Sika Products; Sikaflex; 2c NS EZ Mix.
 - d. Pecora Corporation; Dynatrol II.
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade P, Class 25 minimum, for Use T.
 - 1. Products:
 - a. BASF Building Systems; Master Seal SL 2.
 - b. Sika Products; Sikaflex; 2c SL.
 - c. Pecora Corporation; Dynatrol II SG.

2.4 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. May National Associates, Inc.; Bondaflex Sil-A 700.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.

2.5 POLYUREA SEALANTS

- A. Polyurea Sealant: Semi-rigid, self-leveling, 2-part type. Shore D hardness of 85 when tested in accordance with ASTM D 2240. Tensile strength of 1160 pounds per square inch when tested in accordance with ASTM D 412.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Curecrete Distribution Company, Inc.; Ashford Crete-Fill.
 - b. L&M Construction Chemical, Inc. Joint Tite 750.
 - c. Adhesives Technologies Corp.; Crackbond JF311.

2.6 HYBRID SILICONE SEALANTS FOR RESINOUS WALL TREATMENTS

- A. Basis of Design: Subject to compliance with requirements, provide one of products listed below or a comparable product, with the following product characteristics, submitted to and accepted by Architect.
 - 1. Products:
 - a. BASF; MasterSeal NP 100.
 - 2. Product Characteristics:
 - a. Classification: ASTM C920, Type S, Grade NS, Class 50, Use T.
 - b. Movement Capacity: +/- 50 percent.
 - c. Shore A Hardness: 17 to 23 per ASTM C 661.
 - d. Tensile Strength: 160-200 psi per ASTM D 412.
 - e. Tear Strength 22 lbs per inch per ASTM 1004.
 - f. Color: As selected by Architect from manufacturer's full range of custom options.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings (079200.A04): ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape (079200.A05): 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: Non-staining, 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 joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - 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.

- 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.
 - 4. As sealant work progresses, install tube weeps at 24 inches on center along base of metal wall panels and where indicated.
- D. **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.
- E. **Tooling of Non-sag Sealants:** Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

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 one test for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
 - 2. **Test Method:** Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE (079200.A01)

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Joints between different materials listed above.
 2. Urethane Joint Sealant: Multicomponent, pourable/non-sag, traffic grade, Class 25.
 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. Control and expansion joints in unit masonry.
 - c. Joints in formed metal wall panels.
 - d. Joints in exterior insulation and finish system.
 - e. Joints within and at perimeter of storefront and curtain wall assemblies.
 - f. Control and expansion joints.
 - g. Joints between different materials listed above.
 - h. Perimeter joints between materials listed above and frames of doors, windows and louvers.
 - i. Control and expansion joints in ceilings and other overhead surfaces.
 2. Silicone Joint Sealant: Single component, non-staining, non-sag, neutral curing, Class 50.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated, except for expansion and control joints.
 2. Urethane Joint Sealant: Multicomponent, non-sag, traffic grade, Class 25.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
 - a. Expansion joints in tile and resinous flooring.
 2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing, Class 100/50.
 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.

- E. Joint-Sealant Application: Interior control/contraction joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Control/contraction joints in concrete slabs indicated to receive sealed finish, polished concrete finish, resinous flooring and joints in slabs on grade extending to building exterior, seal watertight.
 - 2. Polyurea Joint Sealant: Polyurea, multi component, self-leveling, traffic grade.
 - 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. 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. Perimeter joints of exterior openings where indicated.
 - c. Vertical joints on exposed surfaces of interior unit masonry and concrete.
 - 2. Joint Sealant: Urethane, multicomponent, non-sag, Class 25, paintable.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint Sealant Application: Interior joints in vertical surfaces.
 - 1. Joint Locations:
 - a. Vertical joints in exposed surfaces of gypsum drywall partitions.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 2. Joint Sealant: Acrylic based, paintable.
 - 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.
- H. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - 2. Joint Sealant: Single component, non-sag, mildew resistant, acid curing, Silicone.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- I. Joint-Sealant Application: Interior control/contraction joints in vertical surfaces (Resinous Wall treatments)
 - 1. Joint Locations:
 - a. Control and expansion joints in CMU, cement board, or gypsum board indicated to receive resinous wall treatment.
 - 2. Joint Sealant: Hybrid Silicone, single component, non-sag, Class 50, traffic grade.
 - 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of custom colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal work.
 - 1. Interior heavy-duty hollow-metal door (081113.A01).
 - 2. Interior extra-heavy-duty hollow-metal door (081113.A02).
 - 3. Hollow-metal frame (081113.A31).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for alternates effecting work of this Section.
 - 2. Section 042000 "Unit Masonry" for embedding anchors for hollow-metal work into masonry.
 - 3. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
 - 4. Section 099113 "Exterior Painting" for field painting of hollow-metal work.
 - 5. Section 099123 "Interior Painting" for field painting of hollow-metal work.
 - 6. Section 099600 "High Performance Coatings" for field painting of hollow metal work.
 - 7. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

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. Shop Drawings: Include the following:
 - 1. Furnish a schedule of doors and frames using same reference numbers for details and openings as those on Drawings.
 - 2. Elevations of each door type.
 - 3. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Locations of reinforcement and preparations for hardware.
 - 6. Details of each different wall opening condition.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
 - 10. Details of conduit and preparations for power, signal, and control systems.
 - 11. For vision lites in hollow metal doors indicated to receive laminated (security) glazing systems, indicate design solutions recommended by laminated (security) glazing manufacturer to provide forced entry

resistance level indicated in Section 088000 "Glazing".

- C. Samples for Verification:
 - 1. For each type of exposed finish required, prepared on Samples of not less than 6 by 8 inches.
- D. 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.
- C. Certifications for High Wind Area Door and Frame Assemblies: Submit written certification confirming tornado resistant door and frame assemblies comply with FEMA 361 and ICC 500-2014.

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 non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
 - 2. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- B. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Steelcraft; an Allegion company.
- B. Source Limitations:
 - 1. 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.
 - 2. For areas required to receive a fire rating greater than 45 minutes, fire testing shall be based on fire resistive criteria according to NFPA 251 or ASTM E119.

- B. Fire-Rated, Borrowed-Life 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.
 - 1. For areas required to receive a fire rating of 45 minutes or greater, fire testing shall be based on fire resistive criteria according to NFPA 251 or ASTM E119.

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. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Doors (081113.A01):
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (18 gauge).
 - 1) Provide metallic-coated cold rolled steel in areas exposed to moisture and as indicated on Drawings.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb for non-fire-rated doors and mineral-board for fire-rated doors.
 - f. Openings in door for vision lites shall be reinforced with manufacturer's recommended steel reinforcement channels at perimeter of vision lite opening.
 - 3. Frames (081113.A31):
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.067 inch (14 gauge).
 - 1) Provide metallic-coated cold rolled steel in areas exposed to moisture and as indicated on Drawings.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded.
 - d. Construction: Fully welded.
 - e. Reinforcement: Provide high frequency hinge reinforcement at top hinge location.
 - 4. Exposed Finish: Prime.
- C. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors (081113.A02):
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch (16 gauge).
 - 1) Provide metallic-coated cold rolled steel in areas exposed to moisture and as indicated on Drawings.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb for non-fire-rated doors and mineral-board for fire-rated doors.
 - f. Openings in door for vision lites shall be reinforced with manufacturer's recommended steel reinforcement channels at perimeter of vision lite opening.
 - 3. Frames (081113.A31):
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.067 inch (14 gauge).
 - 1) Provide metallic-coated cold rolled steel in areas exposed to moisture and as indicated on Drawings.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Knocked down, face welded.
 - 4. Vision Lite:
 - a. For non-fire-rated glass, provide the following:
 - 1) Manufacturer's "flush" type vision lights.
 - b. For fire-rated security glass, provide vision light kit specified.
 - 5. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. General: Anchors for severe storm-resistant door and frame assemblies shall be of sufficient length to provide not less than 5 inches of embedment into adjacent wall construction at jamb.
 - 2. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 3. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 4. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 5. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-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, 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 height adjustment. Terminate bottom of frames at finish floor surface.

2.5 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. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z 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.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. 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.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. 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.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 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. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.

2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 4. 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.
 5. 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.
 6. 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 beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
 7. Reinforcement at Vision Lights: Where fire-rated security glass is indicated for vision lights, provide steel channel reinforcement around inside perimeter of vision light opening as standard by door manufacturer.
- 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 from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 6. 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.
 3. Provide high frequency hinge reinforcement on top hinge only (two additional 10 gauge reinforcements are welded at 3 places each) on all door frames.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted 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. Vision lights shall be "flush" type, without through-bolts, except for vision lights associated with fire-rated security glass as specified in Article 2.8 below.

5. Provide loose stops and moldings on inside of hollow-metal work.
6. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 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.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch 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. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. 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.
- C. Provide high frequency hinge reinforcement on top hinge only (two additional 10 gauge reinforcements are welded at 3 places each) on all door frames.
- D. Reinforce doors and frames to receive continuous hinges where scheduled.

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.

- 1) Provide mortar guards for hinge and strike plate cutouts and any electrical components attached to frames.
- 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.
- g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, 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 plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 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. Vision Light Frames for Fire-Rated Security Glass: Install in strict accordance with vision light manufacturer's written instructions to accommodate glass thicknesses indicated and to meet performance requirements indicated.
- E. Glazing: Comply with installation requirements in Section 088000 "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 o.c. and not more than 2 inches 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. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces (081416.A01 – **Types A1 and B1**).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for those alternates affecting work of this Section.
 - 2. Section 081113 "Hollow Metal Doors and Frames" for hollow metal frames.
 - 3. Section 087100 "Door Hardware" for hardware in flush wood doors.
 - 4. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. 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.
- C. Samples for Initial Selection: For
 - 1. Factory finished doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
 - a. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
 - 2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Certificates: For door manufacturer as set forth in Quality Assurance article.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
 - 1. Do not deliver doors until building interior environmental conditions are maintained to meet Manufacturer's requirements for relative humidity.
- B. Package doors individually in plastic bags or cardboard cartons.
 - 1. Protect doors in place as necessary to prevent scratches, dents, and other damage.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.
- D. Do not place other items on top of stored doors.
- E. Do not drag doors across one another or across other surfaces.
- F. Handle doors using clean gloves.

1.7 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 temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

- 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 in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch 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 / Graham / Marshfield / Mohawk / Masonite Architectural Doors.
 - 2. Eggers Industries.
 - 3. Oshkosh Door Company.
 - 4. VT Industries, Inc.
 - 5. Western Oregon Doors.
- 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 WDMA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. Provide labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

- B. WDMA I.S.1-A Performance Grade:
 - 1. Extra Heavy Duty.
 - 2. Heavy Duty.
- C. 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. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 - 3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 - 4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 5. 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.
- D. Smoke-and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- E. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-2.
 - 2. Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a. 5-inch top-rail blocking, in doors indicated to have closers.
 - b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - 3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- F. Heavy Duty Particleboard-Core Doors:
 - 1. PC-5 Bonded 5-ply Wood Based Particleboard Core Doors shall meet the WDMA Extra Heavy Duty Performance Level unless noted otherwise.
- G. Mineral-Core Doors:
 - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 - 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
 - a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch midrail blocking, in doors indicated to have armor plates.
 - d. 5-inch midrail blocking, in doors indicated to have exit devices.
 - 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - a. Screw-Holding Capability: 550 lbf per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors (081416.A01 – **Types A1 and B1**.
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species:
 - a. **Red Oak**
 - b. Match species of existing wood doors at each location as determined by Architect and Owner from manufacturer's full range of options.
 - 3. Cut:
 - a. Plain sliced (flat sliced).
 - 4. Match between Veneer Leaves:
 - a. Book match.
 - b. Match veneer matching of existing doors at project site.
 - 5. Assembly of Veneer Leaves on Door Faces: Running match.

6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
 - a. Stile edges shall be 2-ply, not less than 1-3/8 inch thick. Outer hardwood edge ply shall be 5/8 inch thick. Inner ply shall be structural composite lumber or hardwood. Stile edges shall be continuous and shall not be finger jointed.
8. Core: Particleboard or structural composite lumber.
9. 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.
 - a. MDF cross bands are not acceptable.
10. Color:
 - a. Stains shall be custom-mixed to match "VT, Riverstone RI18."
11. Doors thickness for the sliding barn doors shall be 1-3/8 inches.

2.4 LIGHT FRAMES AND LOUVERS

- A. General: Light frames are to match light frames in existing doors. Contractor shall field verify material type and profile for light frames.
- B. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish.
 1. Colors to be selected by Architect from full range of manufacturer's options.
 2. Fire Rated Doors: Products shall be listed and labeled for use in doors with fire protection rating required on doors schedule on Drawings.

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.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. 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 088000 "Glazing."
 3. Louvers: Factory install louvers in prepared openings.

2.6 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 two faces, two vertical edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
 - a. Where top edge is visible from an upper level (occupiable space) top edge shall be finished.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:
 1. General: Intent is to match Architect's control sample.
 2. Grade: Premium.

3. Finish: Provide one of the following finishes:
 - a. AWI's "Architectural Woodwork Standards" System 10, UV curable, water based polyurethane.
 - b. WDMA TR-6 catalyzed polyurethane.
4. Staining: Custom, to match Architect's control sample.
5. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
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.
 3. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- 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 081416

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SECTION 084113 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermal Broken Storefront Framing (4.5") (084113.A01).
2. Aluminum Door (Standard)(084113.A11).
3. Aluminum Door (Heavy Duty) (084113.A12).
4. FRP Door (084113.A14).
5. Aluminum Sliding Door (084113.A16).
6. Aluminum Subsills (084113.A21).
7. Aluminum Closure Flashing (084113.A22).
8. Aluminum Pan Flashing (084113.A23).
9. Concealed Flashing (084113.A24).
10. Jamb Closure Membrane (084113.A25).
11. Aluminum Receptor (084113.A26).

B. Related Requirements:

1. Section 012300 "Alternates" for alternates effecting work of this Section.
2. Section 079200 "Joint Sealants" for installation of joint sealants installed in storefronts and entrance framing and for sealants not specified in this Section.
3. Section 087100 "Door Hardware" for door hardware for aluminum doors.
4. Section 088000 "Glazing" for glass within storefront and entrance systems.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, installation instructions, material descriptions, dimensions of individual components and profiles, hardware, accessories and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Elevations shall be drawn at ½ inch scale.
2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. 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. Interface with adjoining building construction.
 - d. Expansion provisions.
 - e. Glazing.
 - f. Flashing and drainage.
4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. Shop Drawings shall be signed and sealed by a structural engineer licensed in the state where the project is located.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1. Architect reserves the right to require additional samples for verification purposes that show fabrication techniques and workmanship.

- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch 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. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.
 - 3. Indicate design solutions for deflections of overhead structure as indicated on Structural Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and field-testing agency.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Preconstruction Test Reports: For sealant.
- E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- D. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not 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.

- E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.
- F. Listings and Labels for Fire-Rated Framing: Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.
- G. Source Limitations:
 - 1. For Aluminum-Framed Storefront Systems: Obtain from single source from single manufacturer.
 - 2. For Heavy-Duty Door Systems: Obtain from single source from single manufacturer.
 - 3. For Aluminum Sliding Door Systems: Obtain from single source from single manufacturer.

1.6 MOCKUPS

- A. Mockups/Field Samples: Build mockups/field samples, to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Mockups/Field Samples: Furnish and install quantity and size of aluminum windows indicated on Drawings within mockup constructed under Section 042000 "Unit Masonry." Mockup/Field Sample will be used set quality standards for materials and execution.
 - a. Install aluminum window to demonstrate surface preparation and installation of: jamb closure membrane, subsill, window framing, and application of perimeter window sealant and associated flashing.
 - b. Window shall include specified glazing where mockup is erected.
 - c. Maintain a 3/8 to 1/2 inch wide gap around entire perimeter of window to receive sealant.
 - d. Coordinate installation of window within mockups to permit inspection by Architect. Approved window installation will set quality standard of installation and aesthetic qualities of workmanship for project.
 - 2. Mockups/Field Sample of Horizontal Sliding Doors: Furnish and install one horizontal sliding door unit, including closure trim, sealant at frames and leveling compound at threshold. Mockup/Field Sample will be used set quality standards for materials and execution. Architect will select opening location for sliding door mockup/field sample.
 - a. Sliding door unit shall include specified glazing where mockup is erected.
 - b. Maintain a 3/8 to 1/2 inch wide gap around entire perimeter of sliding door unit to receive sealant. Where gap exceeds 1/2 inch, provide aluminum closure trim.
 - c. Coordinate installation of sliding door unit mockup to permit inspection by Architect. Approved installation will set quality standard of installation and aesthetic qualities of workmanship for project.
 - 3. Field Samples: Build field sample/mockup of typical wall areas as shown on Drawings.
 - a. Note: Mockup shall be a field sample of storefront, entrance and punched opening areas in Project. Architect and manufacturer's representative will observe installation of first 100 square feet of storefront installation and 100 square feet of entrance framing installation.
 - 4. Field testing shall be performed on field sample areas according to requirements in "Field Quality Control" Article.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Subject to compliance with requirements, approved mockups/field sample areas may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver aluminum framing components in manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry and concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
 - 1. Stack framing components in a manner that will prevent bending and avoid damage.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Check openings by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in the work.

- B. Commencement of aluminum entrance and storefront work will be construed as Installer's acceptance of substrate surfaces and rough openings indicated to receive work of this Section.

1.9 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
 - 3. Warranty period for heavy-duty doors and associated frames shall be ten (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 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

- b. Refer to Structural Drawings for additional information regard structure and deflection criteria.
 - 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- 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 0.04 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 - 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- 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 10.0 lbf/sq. ft. for entrance/storefront framing.
 - 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. Heavy Duty Aluminum Storefront Doors and Frames:
 - 1. Swing Door Cycle Test: Test doors and frames according to ANSI A250.4 as follows:
 - a. Minimum 16,000,000 cycles.
 - 2. Cycle Slam Test Method: Test according to NWWDA T.M. 7-90 as follows:
 - a. Minimum 1,000,000 cycles.
- I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
 - 1. Design Displacement: As indicated on Drawings.
 - 2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
- J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
 - 2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.
- K. 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 0.40 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. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.

- M. Structural-Sealant Joints:
 - 1. Designed to carry gravity loads of glazing.
 - 2. Designed to produce tensile or shear stress of less than 20 psi.
- N. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
 - 1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
 - 2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
- O. Surface Burning Characteristics for FRP Face Sheets:
 - 1. Interior Panels: All FRP face sheets located on the interior shall meet ASTM E 84, Class "A" requirements.
 - 2. Exterior Panels: All FRP face sheets located on the exterior shall meet ASTM E 84, Class "C" requirements.
- P. 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 indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.2 MANUFACTURERS AND PRODUCTS

- A. Basis-of-Design Criteria: Drawings indicate sizes, profiles, and dimensional requirements for storefront, entrance and window framing systems required, that are based on specific types, models and performance criteria indicated. Systems from other manufacturers may be considered, provided deviations in dimensions, profiles and performance are minor and do not change the design concept as judged by the Architect. Burden of proof is on the proposer.
- B. Basis-of-Design Products for Storefront Framing Systems: Subject to compliance with requirements, provide or one of the systems listed below or comparable product submitted to and accepted by Architect prior to bidding.
 - 1. Thermally Broken Storefront and Entrance Framing (084113.A01 – **Type 1 and Type 2** – Center Plane Glazed):
 - a. Basis of Design: Kawneer North America; Trifab VG 451T.
 - b. EFCO Corporation; S 403.
 - c. Manko Windows and Doors; 2450 Series.
 - d. Tubelite; 14000.
 - 2. Interior standard-duty manual-swing doors (084113.A11 - **E09**):
 - a. Basis-of-Design: Kawneer North America; Series 500 Wide Stile.
 - 1) EFCO Corporation; D-500.
 - 2) Manko Windows and Doors; 150 Series.
 - 3) Tubelite; Comparable product.
 - 3. Heavy-Duty (Stile and Rail Construction) Manual-Swing Doors and Associated Frames (084113.A12 - **E10**):
 - a. Basis-of-Design: Special-Lite, Inc. No substitutions allowed.
 - 1) Exterior heavy-duty manual-swing entrance doors: Model "SL-15" (wide stile).
 - 4. Heavy-Duty (FRP Clad Construction) Manual-Swing Doors and Associated Frames (084113.A14):
 - a. Basis-of-Design: Special-Lite, Inc. No substitutions allowed.
 - b. Exterior heavy-duty FRP manual-swing doors (**Type A8, B8**):
 - 1) Pebble Grain Texture - Basis of Design: "SL-17" by Special-Lite, Inc.
 - c. Color: As selected by Architect from Manufacturer's standard colors.
 - 5. Interior horizontal sliding doors (084113.A16 - **Type G1**):
 - a. Basis-of-Design: Kawneer North America; Model 1010 Sliding Mall Front, OXXX Configuration.
 - b. Comparable products may be acceptable, when submitted to and accepted by Architect prior to bidding.
 - c. Interlocking Hardware: Manufacturer and Installer shall provide recommended hardware for a sequentially opening and sequentially closing operation of mall front panels. Independent sliding panels will not be acceptable.
 - 1) All hardware required for sequentially opening and sequentially closing operation shall be included under the base bid.
 - 2) Possible hardware shall include but not be limited to cushion shoe support brackets to assure there are not door pinch points between panels.

- d. Door Pull: Aluminum tube pull.
 - e. Locking Devices: Provide manufacturer's standard operation as indicated in Section 087100 "Door Hardware."
- C. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing 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:
 - a. Thermally broken
 - 2. Glazing System:
 - a. Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane:
 - a. As indicated in Article 2.2 "Manufacturers and Products"
 - 4. Finish: Refer to Exterior Finish Legend on Drawings for locations.
 - a. Clear anodized finish.
 - 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. Pressure Caps: Manufacturer's standard snap-on aluminum caps that mechanically retain glazing.
- 1. Provide extended caps where indicated.
 - 2. At 90 degree outside corners, provide pre-manufactured mullion cap/trim as single unit to cover both sides where shown.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Materials:
- 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
 - 3. Pultruded Fiberglass: Manufacturer's standard.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
- 1. General:
 - a. Thermal Construction: Manufacturer's standard elastomeric type.
 - b. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - 1) Provide nonremovable glazing stops on outside of door.
 - 2. Heavy Duty - FRP Clad Door Construction (084113.A14): 1-3/4-to 1-7/8-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Corners shall be mitered or mortise and tenon, reinforced with angle blocks and 3/8-inch diameter full-width galvanized steel tie rods. FRP face sheets shall be rabbeted and secured on all four sides by full-length integral reglets on edges of the stiles and rails.

- a. Exterior heavy-duty FRP manual-swing doors (**Type A8, B8**): Face sheets shall be pebble-textured, 0.120 inch thick FRP in color selected by Architect. Core shall be poured-in-place polyurethane foam, 5 pcf density achieving a minimum R-value of 9.
- 3. Interior horizontal sliding doors (084113.A16): Doors shall be as indicated. Tracks shall be low-profile type to suit stacking indicated. Track shall be surface-mounted unless indicated otherwise.
- B. Entrance Door Framing and Subframing:
 - 1. Door Framing (Heavy Duty Doors):
 - a. For 4-1/2 inch framing – Basis of Design: Special-Lite, Inc.; “SL-245FG”, compatible with storefront framing system.
 - b. At the request of the Owner, substitutions for this product are not allowed.
 - 2. Door Subframing: Manufacturer’s standard, not greater than 1-inch face dimension for use at entrances within curtain wall. Finish to match adjacent curtain wall framing.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
 - 1. Hardware for heavy-duty aluminum doors shall be installed at the door manufacturer’s factory and be included in the warranty.
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule, Section 087100 “Door Hardware”, and as specified hereinafter.
 - 1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 - 2. Opening Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
 - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- D. Mullions: Provide keyed removable center mullions.
- E. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- F. Weather Stripping: Manufacturer's standard replaceable components. “Fin” type stops and vinyl weatherstripping are not acceptable.
 - 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.
- G. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- H. Silencers: BHMA A156.16, Grade 1.
- I. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- J. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

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. Sealant shall have a VOC content of 250 g/L or less.
 - 2. 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."
- D. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
- E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with other system components with which it comes in contact; recommended by weatherseal-sealant and glazed storefront manufacturers for this use.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.
 - 2. Color: Match structural sealant.
- F. Security Glazing: Refer to Section 088000 "Glazing" for minimum edge engagement.

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. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of exposed hardware, use exposed fasteners with countersunk Phillips screw heads or flat-head machine screws, fabricated from 300 series stainless steel.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch 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. Aluminum Subsills (084113.A21): Provide high performance subsill that incorporates a watertight interior back leg with end dams and integral water collection trough that weeps to exterior. Subsill shall be of profile and dimensions required for installation indicated. Finish subsill to match adjacent aluminum framing. Seal all penetrations through subsills to be watertight.
 - 1. Provide high performance subsills at all storefront, entrance and window framing, unless specifically indicated otherwise.
- D. Aluminum Closure Flashing (084113.A22): Provide prefinished aluminum, not less than 0.090 inch thick, of alloy and type selected by manufacturer for compatibility with other components. Fabricate closure flashing to configurations indicated. Finish to match adjacent storefront, entrance and window framing. Seal closure flashing to be watertight.
- E. Aluminum Pan Flashing (084113.A23): Provide prefinished aluminum, not less than 0.090 inch thick, of alloy and type selected by manufacturer for compatibility with other components. Fabricate pan flashing to configurations indicated to direct water to exterior away from storefront and window framing. Finish to match adjacent storefront and window framing.

- F. Aluminum Jamb Extensions: prefinished aluminum of finish, size, profile and material to match framing system. Anchor to framing member. Extension depth as indicated on drawings.
 - 1. Size: As indicated on Drawings.
- G. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- H. Jamb Closure Membrane (084113.A25):
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products:
 - a. "CCW-705-TWF"; as manufactured by Carlisle Coatings and Waterproofing.
 - b. "Perm-A-Barrier Wall Flashing"; as manufactured by Grace Construction Products.
 - c. "Air-Shield"; as manufactured by W. R. Meadows, Inc.
 - d. "Blueskin"; as manufactured by Henry Corp.
 - 2. Product Characteristics:
 - a. Self-adhering, membrane, 40 mils thick.
 - b. Flashing shall function as an air, vapor and water barrier.
 - c. Flashing shall be compatible with air barrier coating specified in Section 072729.
- I. Aluminum Receptor (084113.A26): Provide manufacturer's high performance head compensating receptor as required. Provide prefinished aluminum, of alloy and type selected by manufacturer for compatibility with other components. Finish to match adjacent storefront, entrance and window framing. Seal all penetrations through head to be watertight.
 - 1. Provide high performance head compensating receptor as indicated on the drawings.
- J. Aluminum Snap Trim (Mullion Extensions)(084113.A33): Provide prefinished aluminum trim, in manufacturer's standard thickness, of alloy and type selected by manufacturer for compatibility with other components. Snap trim shall be two-piece trim, including continuous trim clip and continuous trim cover. Finish for trim clip shall be mill finish. Finish for trim cover to match adjacent storefront and window framing.
 - 1. Size: As indicated on Drawings.
- K. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil 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 interior.
 - 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. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using shear-block system, or screw-spline system, or head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior door frames, provide compression weather stripping at fixed stops.
 - 2. At interior door frames, 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.

- 3. Fin-type door stops are not acceptable.
- H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. Heavy Duty – Stile and Rail Construction (084113.A12): Aluminum standard doors shall be fabricated as previously specified.
 - 2. Heavy Duty – FRP Clad Construction (084113.A14): Aluminum heavy-duty doors with FRP face sheets shall have mitered corners and full-width 3/8-inch diameter galvanized steel tie rods secured with locking hex nuts.
 - 3. Reinforce doors as required for installing entrance door hardware.
 - 4. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 5. At exterior doors, provide weather sweeps applied to door bottoms.
- I. 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.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.10 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure non-movement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
 - 7. Completely fill gaps between shims and adjacent construction with loose fiberglass insulation or spray foam insulation.
 - 8. At fire-rated openings, install frames according to NFPA 80.
 - 9. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 10. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

- 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.
 - 1. Install two-piece snap trim with long leg oriented horizontally and short leg fastened to aluminum framing, so that trim cover is exposed, and trim clip is concealed. Secure trim to aluminum framing and adjacent construction in accordance with trim manufacturer's written instructions.
- E. Prior to installation of perimeter vertical members, install jamb closure membrane at cavity walls to cover gap/joint between interior and exterior substrates. Intent is to seal air cavity and joints between substrates. Extend membrane from interior face of framing/blocking to exterior. Trim membrane so that it will not be exposed to view after vertical members are set, and edge of membrane is terminated in sealant installed around perimeter of aluminum framing.
 - 1. Seal tops of end dams at jambs to adjacent construction or extend jamb closure membrane over end dam to direct water into subsill in order to drain to exterior.
- F. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- G. Install glazing as specified in Section 088000 "Glazing."
- H. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- I. 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.

3.4 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; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: 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 tests in each test area as directed by Architect.
 - 1) For punched openings, test 25 percent of installation, in each type of exterior finish substrate, unless noted otherwise.
 - 2) For storefront, and clerestories; test each installation, unless noted otherwise.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
 1. Test a minimum of four areas on each building facade.
 2. Repair installation areas damaged by testing.
- D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 084113

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SECTION 085613 - TRANSACTION WINDOWS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sliding Service window (085613.A01).
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for transaction window lock coordination.
 - 2. Section 088000 "Glazing" for laminated glass requirements for sliding window.
 - 3. Section 123666 "Solid Surface Countertops" for sill mounting coordination.

1.2 COORDINATION

- A. Coordinate installation of anchorages for windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for window units.
- B. Required 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.
 - 3. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 4. Product Certificates: For materials manufactured within 100 miles (160 km) of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
 - 5. Environmental Product Declaration: For products which the Manufacturer has made product-specific declaration involving EPDs or another USGBC-approved program for environmental product declarations.
 - 6. Health Product Declaration: For product which the Manufacturer has made a product-specific declaration involving HPDs or another USGBC-approved program for material ingredient reporting.
 - 7. Material Optimization: For products which the Manufacturer has made product-specific declarations involving GreenScreen v1.2, Cradle to Cradle, REACH, or another USGBC-approved program for building product optimization.
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachments to other work.
 - 2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
 - 3. Details of shelf.
 - 4. Hardware for sliding window units.
 - 5. Glazing details.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Framing: 12-inch-long sections of frame members.
 - 2. Glazing: 6-inch square sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Examination reports documenting inspections of substrates, areas, and conditions.
- C. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Pack windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.
- B. Label window packaging with drawing designation.
- C. Store crated security windows on raised blocks to prevent moisture damage.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including deflections exceeding 1/4 inch.
 - b. Failure of welds.
 - c. Excessive air leakage.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SLIDING SERVICE WINDOW (085613.A01)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide C.R.Lawrence; "CRL Horizontal Sliding "Daisy" Pass-Thru Assembly with D6 Header & Jambs - D1041A".
 - 1. Comparable products from other manufacturers meeting specified requirements will be considered, when submitted to Architect prior to bidding. Comparable products acceptable to Architect will be set forth by Addendum. Refer to Sections 012500 and 016000 for requirements on submitting comparable products.
- B. Product Characteristics and Features:
 - 1. Configuration: Two Equal sliding glazed panel.
 - a. Unit size: Refer to drawings.
 - b. Service Opening: Refer to drawings.
 - c. Operation Type: Manual.
 - d. Opening Direction: Refer to drawings.
 - e. Frame: D6 Overhead Track with Jambs
 - f. Finish: Satin Anodized Aluminum.

- g. Glazing: Refer to drawings.

2.2 FABRICATION

- A. General: Fabricate windows to provide a complete system for assembly of components and anchorage of window units.
 - 1. Provide units that are preglazed at the factory.
 - 2. Provide units that are reglazable from the secure side without dismantling the non-secure side of framing.
 - 3. Prepare teller windows for field glazing.
- B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.
- C. Glazing Stops: Finish glazing stops to match teller window framing.
 - 1. Non-Secure-Side (Exterior) Glazing Stops: Welded or integral to framing.
 - 2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.
- D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- F. Weather Stripping: Factory applied.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.5 ACCESSORIES

- A. Concealed Bolts: ASTM A 307, Grade A unless otherwise indicated.
- B. Cast-in-Place Anchors in Concrete: Fabricated from corrosion-resistant materials capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified testing agency; of type indicated below.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 27/A 27M cast steel or ASTM A 47/A 47M malleable iron. Provide bolts, washers, and shims as required; hot-dip galvanized according to ASTM A 153/A 153M or ASTM F 2329/F 2329M.
- C. Embedded Plate Anchors: Fabricated from mild steel shapes and plates, minimum 3/16 inch thick; with minimum 1/2-inch-diameter, headed studs welded to back of plate.
- D. Glazing Strips and Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Molded EPDM or neoprene gaskets complying with ASTM D 2000, Designations 2BC415 to 3BC620; molded PVC gaskets complying with ASTM D 2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.
 - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric backing.

- E. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.
 - 1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
 - 2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
 - 3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B 633; provide sufficient strength to withstand design pressures indicated.
- G. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security windows.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
- C. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
- B. Glazed Framing: Provide sealant-glazed framing. Comply with installation requirements in Section 088000 "Glazing."
- C. Removable Glazing Stops and Trim: Fasten components with security fasteners.
- D. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel fasteners in stainless-steel materials.
- E. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.
 - 1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.

2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

- F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

3.5 ADJUSTING

- A. Adjust horizontal-sliding, teller (transaction) windows to provide a tight fit at contact points for smooth operation and a secure enclosure.
- B. Remove and replace defective work, including teller windows that are warped, bowed, or otherwise unacceptable.

3.6 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
- B. As applicable, clean glass of preglazed security windows promptly after installation. Comply with requirements in Section 088000 "Glazing" for cleaning and maintenance.
- C. Provide temporary protection to ensure that windows are without damage at time of Substantial Completion.

END OF SECTION 085613 085613

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SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Intent: The intent of this Section is to provide finish hardware for the proper operation and control of all wood, hollow metal and aluminum doors in the Project. Prior to bidding, notify the Architect of any doors that do not have hardware meeting this intention.
- B. This Section includes items known commercially as finish or door hardware that are required for swinging doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed. This Section includes, but is not necessarily limited to furnishing and installing complete, the following:
 - 1. Finish hardware for proper operation and control of all wood, aluminum and hollow metal doors, including hinges, locks and latch sets, closers, panic devices, auto-flushbolts, electric strikes, magnetic holders, removable mullions, cylinders, keys, miscellaneous stops, flat goods, weatherstripping and thresholds as required.
 - 2. Cylinder for access doors where specified.
- C. Related work in other sections:
 - 1. Hollow metal doors, frames and silencers: Section 081113.
 - 2. Wood doors: Section 081416.
 - 3. Aluminum doors: Section 084113.

1.2 DEFINITIONS

- A. "Finish Hardware" includes items known commercially as finish hardware which are required for swing, and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturers technical product data for each hardware item. Include information necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finishes.
 - 1. Manufacturer shall submit written certification confirming closers compliance with U.L. 10C.
- B. Hardware Schedule: Submit a hardware schedule in a vertical format (horizontal format not acceptable), organized into sets, including the information below. Designations for door numbers and hardware sets in the schedule shall match those used in the Construction Documents for each opening.
 - 1. Hardware Schedule shall be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware.
 - 2. Catalog cuts of each type of exposed hardware unit, highlighted in color to indicate compliance with the Hardware Schedule.
 - 3. Type, style, function, size and finish of each hardware item.
 - 4. Name and manufacturer of each item.
 - 5. Fastenings and other pertinent information.
 - 6. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
 - 7. Mounting locations for hardware.
 - 8. Door and frame sizes and materials.
 - 9. Deviations from Specifications shall be noted in cover letter.
- C. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- D. Keying Schedule: Submit separate detailed schedule, at the same time as the Hardware Schedule, indicating keying for all locks and how Owner's instructions, on keying of locks has been fulfilled. Keying schedule must be approved before ordering any locks.

- E. Pinning Transcript: Submit detailed schedule indicating each lock cylinder and core.
- F. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
- B. Product/Material Qualifications: Manufacturer's product numbers are indicated for convenience in identifying finish hardware items. Unless otherwise indicated, manufacturer's description for indicated product number constitutes minimum standards of quality, design, function and performance required for each item to be incorporated into the Project.
 - 1. It will be the responsibility of the Bidder to furnish with his Bid a list clarifying any deviations from these specifications written or implied, in order that a fair and proper evaluation be made. Those Bidders not submitting a list of deviations will be presumed to have Bid as specified.
- C. Supplier Qualifications: A recognized Architectural Finish Hardware Supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years. Supplier shall be or employ an experienced Architectural Hardware Consultant (AHC) who is certified by and member of the Door and Hardware Institute. The Architectural Hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.
 - 1. Supplier shall meet with the Owner to finalize keying requirements and obtain final instructions in writing.
- D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Pamphlets No. 80, No. 101 and of authorities having jurisdiction requirements. Provide only hardware which has been tested and listed by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and door frame labels.
 - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".
- E. Standards: Comply with the requirements of the latest edition of the following standards, unless indicated otherwise:
 - 1. American National Standards Institute (ANSI) Publications:
 - 1. A115 Series - Door and Frame Preparation.
 - 2. A156 Series - Hardware.
 - 2. Builders Hardware Manufacturers Association (BHMA) Publications:
 - 1. 1201 - Auxiliary Hardware.
 - 2. 1301 - Materials and Finishes.
 - 3. Door and Hardware Institute (DHI) Publications:
 - 1. Keying - Procedures, Systems, and Nomenclature.
 - 2. Abbreviations and Symbols.
 - 3. Hardware for Labeled Fire Doors.
 - 4. Recommended Locations for Builder's Hardware for Standard and Custom Steel Doors and Frames.
 - 5. Wood Door Standards W1, W2, WDHS-2, WDHS-3.
 - 4. National Fire Protection Association (NFPA) Publications:
 - 1. NFPA Pamphlet No. 80 - Standards for Fire Doors and Windows.
 - 5. International Building Code - current edition adopted.
 - 6. Americans with Disabilities Act (ADA).
- F. Keying Conference: Conduct conference in accordance with Section 013100. In addition to Owner, Construction Manager, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2. Preliminary key system schematic diagram.
 - 3. Requirements for key control system.

4. Address for delivery of keys.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Section 013100 as follows:

1. Architectural Finish Hardware supplier (AFHS) shall conduct the preinstallation conference at the site. The AFHS shall instruct finish hardware installer on proper installation, adjustment and troubleshooting for each operable item of finish hardware specified. The AFHS shall observe the installation and adjustment of the first three locksets, closers and exit devices.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark or tag each box with hardware heading and door number according to approved hardware schedule.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation. Provide a complete packing list showing items, door numbers and hardware headings with each shipment.
- D. Store hardware in shipping cartons above ground and under cover to prevent damage.
 1. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.
- E. Aluminum Door Hardware: If required by door manufacturer deliver hardware for aluminum doors as directed by the door supplier for factory installation.

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system, as applicable.

1.7 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 HARDWARE - GENERAL

- A. Provide the materials or products indicated by trade names, manufacturer's name, or catalog number.
- B. Provide manufacturer's standard products meeting the design intent of this Specifications, free of imperfections affecting appearance or serviceability.
 1. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

2. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and any specialized tools as required for satisfactory installation and adjustment.
 3. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
 4. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated or approved. Finish screws exposed under any condition to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as
 5. Finish all other hardware in accordance with the BHMA finish as follows, unless otherwise indicated in manufacturers screws to secure hardware.
 6. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex bolt fasteners.
 7. Provide factory pinned cylinders and cores.
- C. Hardware is specified in the hardware schedule by set, type, and functions which have been selected as best meeting the application requirements. Acceptable products for each category are specified under PART 2 of this Specification.

2.2 SPECIAL REQUIREMENTS

- A. Hinges:
1. Provide non-removable pins for all exterior doors and out-swinging corridor doors. Use nonrising pins for all other doors.
 2. Pre-drill pilot holes for hinge fasteners at factory to suit hinge type.
 3. Provide continuous hinges where specified.
- B. Locksets:
1. Locksets shall meet or exceed ANSI A156.13-94, Grade 1 requirements.
- C. Panic Devices:
1. All panic devices shall have touchbars made of stainless steel, provide devices in stainless finish where specified.
 2. All latchbolts are to be deadlatching.
 3. Panic devices shall be through-bolted, using sex bolt fasteners.
 4. Exit devices are to incorporate a flush and tapered end cap.
 5. Hardware mullions are to be of the same manufacturer as the panic device. Provide keyed mullions unless otherwise specified. Provide mullion storage kits where specified.
 6. Except on fire-rated doors, or unless specified otherwise, provide panic devices with hex key dogging device to hold latch bolt open on doors with closers.
 7. Devices incorporating plastic dogging components will not be allowed.
 8. Provide electrical options as specified.
- D. Closers:
1. Comply with manufacturer's recommendations for unit size based on door size, weather exposure and usage.
 2. Through-bolt all closer units, using sex bolt fasteners.
 3. Provide parallel arms for all overhead closers, except as otherwise indicated.
 4. All surface closers shall exceed ANSI A156.4 Grade 1 requirements in all aspects as called for below. All closers shall have certification by an independent testing laboratory of 10,000,000 cycles without failure. Provide special rust inhibitive primer (SRI) where specified.
 5. Furnish all brackets, drop plates and any other necessary hardware required to insure proper installation.
- E. Stops
1. Provide heavy duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide overhead stop for interior doors that swing more than opens against equipment, casework, sidelights, and where conditions do not allow wall stop.
- F. Thresholds and Gasketing
1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.

2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
3. Gasketing and astragals on aluminum frames by door manufacturer.

G. Silencers

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.3 KEYING

- A. Standard Lock Cylinders: BHMA A156.5; Grade 1 cylinders; face finished to match lockset.
- B. Key all locks separately, or alike, as directed by the Owner's representative and Architect. Provide keys as follows:
 1. Change Keys: Two (2) per lock.
 2. Master Keys: Six (6) required (per system).
- C. Existing Key System: Key cylinders to Owners existing master key system.
- D. All exterior doors to be keyed to Schlage Primus, interior doors to match existing keyway.
- E. Provide Schlage cylinders with large format interchangeable construction cores on all exterior openings.

2.4 KEY CONTROL SYSTEM

- A. Fire Department Access Boxes:
 1. Provide key lock boxes designed for storage of 2-5 keys. Manufactured by Knox Company or equal.
 2. Provide one lock box at exterior and provide one near elevators, if applicable.
 3. Locate in accordance with architectural detail. Where not specifically indicated, locate as directed by Architect.
 4. Provide surface mounted or recessed based on direction from Architect.

2.5 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door to the greatest extent possible, unless otherwise indicated. In general, match items to the finish for the latch, lock or push-pull unit for color and texture.
 1. Product description or schedule:
 - 1) 626 satin chrome-plated.
 - 2) 630 satin stainless steel.

2.6 HARDWARE PRODUCTS

- A. Hinges:
 1. Specified manufacturer: IVES Hardware; an Allegion Company.
 2. Acceptable substitutions:
 1. Hager Companies.
 2. McKinney Products Company; an ASSA ABLOY Group company.
 3. Stanley Commercial Hardware; Div. of The Stanley Works.
- B. Continuous Gear-Type Hinges:
 1. Specified manufacturer: IVES Hardware; an Allegion Company.
 2. Acceptable substitutions:
 1. Hager Companies.
 2. McKinney Products Company; an ASSA ABLOY Group company.
 3. Select Products Limited.
- C. Locksets:
 1. Specified manufacturer: Schlage Commercial Lock Division; an Allegion Company.
 2. Substitutions: Not allowed. Products to match District standard.
- D. Exit Devices:
 1. Specified manufacturer: Von Duprin; an Allegion Company

2. Substitutions: Not allowed. Products to match District standard.
- E. Closers:
 1. Specified manufacturer: LCN Closers; an Allegion Company.
 2. Substitutions: Not allowed. Products to match District standard.
- F. Flatgoods:
 1. Specified manufacturer: Ives Hardware; an Allegion Company.
 2. Acceptable substitutions:
 1. Burns.
 2. Rockwood.
- G. Stops:
 1. Specified manufacturer: Ives Hardware; an Allegion Company.
 2. Acceptable substitutions:
 1. Burns Manufacturing Incorporated.
 2. Hager Companies.
 3. Rockwood Manufacturing Company.
 4. Trimco
- H. Overhead stops:
 1. Specified manufacturer: Glynn-Johnson; an Allegion Company.
 2. Acceptable substitutions:
 1. Architectural Builders Hardware Mfg., Inc.
 2. Door Controls International.
 3. Ives Hardware; an Allegion Company.
 4. Rixson Specialty Door Controls; an ASSA ABLOY Group.
- I. Thresholds:
 1. Specified manufacturer: Zero International
 2. Acceptable substitutions:
 1. Pemko Manufacturing Co.
 2. Reese Enterprises.
 3. National Guard Products.
- J. Door Gasketing/Weatherstripping:
 1. Specified manufacturer: Zero International
 2. Acceptable substitutions:
 1. Pemko Manufacturing Co.
 2. Reese Enterprises.
 3. National Guard Products.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Carefully inspect doors, frames, and conditions under which hardware will be installed. Notify the Architect of any conditions that would adversely affect the installation or subsequent door operations. Do not proceed until unsatisfactory conditions are corrected.
 1. Frames shall be verified, inspected, and confirmed by General Contractor as being plumb and true.
- B. Refer to Sections 081113, 081416, and 084113 for additional installation requirements.
- C. Prior to hardware installation, the Hardware Supplier shall meet with the Owner's Representative, Architect, and Hardware Installer to ensure the Installer has and understands the manufacturers' installation requirements for all hardware items.
 1. The Supplier shall observe the installation of the first lockset, closer and panic device.

3.2 INSTALLATION

- A. Mount Hardware units at heights indicated in respective DHI Standards, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

- B. Install each hardware item in compliance with the manufacturer's instructions and written recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be field finished, coordinate removal, storage and reinstallation or application of surface protections with finishing work. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
 - 1. Special care shall be taken to avoid damaging surrounding surfaces.
- D. Provide fasteners and anchoring devices of suitable size, quantity, and type to secure hardware in proper position for heavy use and long life.
 - 1. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Adjust door closers immediately upon installation. Adjust in exact conformance with manufacturer's printed instructions. Advance backcheck to eliminate shock at dead stop. Set latching speed to assure unassisted positive latching.
 - 1. Degrees of swing of doors for self-limiting closers shall be maximum available.
- F. Install each protection plate with a thinly-spread spot of mastic at its center to assure even contact before fastening with screws. Install all such plates on visual centers of closed doors. Set bottom edges of all such plates flush with door bottom.
- G. Cut and fit thresholds to door frame profiles. Prepare thresholds for the attachment of strikes and clearance for spindles as required. Set thresholds in a continuously laid bed of polyisobutylene mastic sealant to completely fill voids and exclude moisture from every source.
- H. Seal weather protection components attached to the exterior sides of doors and frames, such as drip caps and weatherstripping, in place with clear silicone caulk in such a manner as to ensure a continuously filled seam throughout the joinery.
- I. Cut and fit weatherstripping accurately to provide the greatest possible continuity of the contact element. Adjust closer templating as required.
- J. At exterior doors, obtain satisfactory operation of the installation, then apply a thin layer of clear silicone caulk under hinge leaves, and outside lock trim. Remove excess caulk after torqueing fasteners.

3.3 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
 - 1. Clean adjacent surfaces soiled by hardware installation.
- B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 INSTRUCTION AND INSPECTION

- A. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
- B. After hardware is installed and adjusted, the Supplier shall inspect the job with the Architect and the Contractor to determine if the hardware is functioning properly.
 - 1. Maintain the instruction sheets, layout templates, and any supplementary literature regarding hardware in a readable condition. Transmit all such items to the Owner's Representative, together with all spare parts, specialized tools, other accessories supplied with the hardware, and a copy of the approved hardware schedule at the time of instruction.
- C. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult

with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units at no cost to the Owner. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

HARDWARE SETS

HARDWARE SET: 01

DOOR NUMBER:

128

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-MT54	689	VON
1	EA	ELEC PANIC HARDWARE	HD-RX-LC-QEL-99-L-DT-06-CON 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	HD-RX-LC-QEL-99-L-NL-06-CON 24 VDC	626	VON
1	EA	RIM HOUSING	20-079 X 23-030 ICX	626	SCH
1	EA	PRIMUS MORT. CYL.	20-700	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
2	EA	OH STOP & HOLDER	90H	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
2	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
2	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	WEATHERSTRIP	BY DOOR/FRAME MANUF		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS VIA VALID CARD READ. PANICS MAY BE DOGGED (MADE PUSH/PULL) ELECTRONICALLY OR VIA HEX KEY ON DEVICE. ALWAYS FREE EGRESS.

HARDWARE SET: 01A

DOOR NUMBER:

100A

108B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB (*SPECIAL 315 FINISH)	689	VON
1	EA	ELEC PANIC HARDWARE	HD-QEL-99-L-DT-06 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	HD-QEL-99-L-NL-06 24 VDC	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
1	EA	CYLINDER	BY OWNER	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30 SRT	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
2	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	WEATHERSTRIP	BY DOOR/FRAME MANUF		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS VIA VALID CARD READ. PANICS MAY BE DOGGED (MADE PUSH/PULL) ELECTRONICALLY OR VIA HEX KEY ON DEVICE. ALWAYS FREE EGRESS.

HARDWARE SET: 01B

DOOR NUMBER:

100B 108A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB (*SPECIAL 315 FINISH)	689	VON
1	EA	ELEC PANIC HARDWARE	HD-QEL-99-L-DT-06 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	HD-QEL-99-L-NL-06 24 VDC	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	MORTISE CYLINDER	20-001	626	SCH
1	EA	CYLINDER	BY OWNER	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30 SRT	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	WEATHERSTRIP	BY DOOR/FRAME MANUF		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS VIA VALID CARD READ. PANICS MAY BE DOGGED (MADE PUSH/PULL) ELECTRONICALLY OR VIA HEX KEY ON DEVICE. ALWAYS FREE EGRESS.

HARDWARE SET: 02

DOOR NUMBER:

128A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	HD-RX-LC-QEL-99-L-NL-06-CON 24 VDC	626	VON
1	EA	RIM HOUSING	20-079 X 23-030 ICX	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	OH STOP & HOLDER	90H	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
1	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	WEATHERSTRIP	BY DOOR/FRAME MANUF		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS VIA VALID CARD READ. PANICS MAY BE DOGGED (MADE PUSH/PULL) ELECTRONICALLY OR VIA HEX KEY ON DEVICE. ALWAYS FREE EGRESS.

HARDWARE SET: 03

DOOR NUMBER:

135

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
2	EA	EPT COVER PLATE	EPT-1	GRY	DON
1	EA	PANIC HARDWARE	99-EO	626	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30 SRT	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61 SRT	689	LCN
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
1	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	WEATHERSTRIP	BY DOOR/FRAME MANUF		

NOTE: PREP DOOR/FRAME FOR FUTURE ACCESS CONTROL.

HARDWARE SET: 04

DOOR NUMBER:

122A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU STOREROOM LOCK	ND80LDEU RHO RX CON 12V/24V DC	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	MAGNET	SEM7850 12V/24V/120V	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. ALWAYS FREE FOR EGRESS.

HARDWARE SET: 05

DOOR NUMBER:

117 131 134 137

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU STOREROOM LOCK	ND80LDEU RHO RX CON 12V/24V DC	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA (4040XP HEDA AT 134)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA (AT RATED OPENINGS)	BK	ZER
3	EA	SILENCER	SR64 (AT NON-RATED OPENINGS)	GRY	IVE
1	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. ALWAYS FREE FOR EGRESS.

HARDWARE SET: 06

DOOR NUMBER:

101 129 130

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU STOREROOM LOCK	ND80LDEU RHO RX CON 12V/24V DC	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. ALWAYS FREE FOR EGRESS.

HARDWARE SET: 07

DOOR NUMBER:

125A 125B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	EU STOREROOM LOCK	ND80LDEU RHO RX CON 12V/24V DC	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP HW/PA	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR CONTACT	BY OWNER	BLK	SCE
1	EA	POWER SUPPLY	BY OWNER		
1	EA	NOTE	CARD ACCESS BY OTHERS		

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. ENTRY VIA VALID CARD READ. ALWAYS FREE FOR EGRESS.

HARDWARE SET: 08

DOOR NUMBER:

107

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	626	IVE
1	EA	STOREROOM LOCK	ND80LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB1/MB2	689	IVE
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	ARMOR PLATE	8402 34" X 2" LDW B-CS	630	IVE
2	EA	MAGNET	SEM7850 12V/24V/120V	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 09

DOOR NUMBER:

116

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	FIRE EXIT HARDWARE	9447-EO-F-LBR	626	VON
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	MAGNET	SEM7850 12V/24V/120V	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
2	EA	ASTRAGAL	8195AA	AA	ZER

HARDWARE SET: 10
DOOR NUMBER:

112

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	MAGNET	SEM7850 12V/24V/120V	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 11
DOOR NUMBER:

111A 111B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	ARMOR PLATE	8402 34" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	MAGNET	SEM7850 12V/24V/120V	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 12
DOOR NUMBER:

103A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: 13

DOOR NUMBER:

103 106 109

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 14

DOOR NUMBER:

126A 126B

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	SURFACE CLOSER	4040XP HW/PA	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 15

DOOR NUMBER:

104	105	106A	118	119	120
123	124	132	133	136	

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50LD RHO	626	SCH
1	EA	K-I-L CYLINDER	23-065	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: 16

DOOR NUMBER:

110

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	OFFICE W/SIM RETRACT	L9056L 06A L583-363 L283-722	626	SCH
1	EA	MORTISE CYLINDER	30-021	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 17

DOOR NUMBER:

114 115 138

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

HARDWARE SET: 18

DOOR NUMBER:

113 127

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
			EXISTING DOOR, FRAME AND HARDWARE		

HARDWARE SET: 19

DOOR NUMBER:

105A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1			HARDWARE BY DOOR / FRAME MANUFACTURER		

DOOR/HARDWARE SET INDEX

DOOR #	HwSet #
100A	01A
100B	01B
101	06
103	13
103A	12
104	15
105	15
105A	19
106	13
106A	15
107	08
108A	01B
108B	01A
109	13
110	16
111A	11

DOOR #	HwSet #
111B	11
112	10
113	18
114	17
115	17
116	09
117	05
118	15
119	15
120	15
122A	04
123	15
124	15
125A	07
125B	07
126A	14

DOOR #	HwSet #
126B	14
127	18
128	01
128A	02
129	06
130	06
131	05
132	15
133	15
134	05
135	03
136	15
137	05
138	17

END OF SECTION

SECTION 088000 - GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - a. Windows.
 - b. Doors.
 - c. Interior borrowed lites.
 - d. Storefront framing.
 - e. Glazed entrances.
 - 2. Glazing sealants and accessories.
 - 3. Glass types include:
 - a. Fully Tempered Monolithic Float Glass.
 - b. Laminated Glass.
 - c. Insulated Glass.
 - d. Insulated Fully Tempered Glass.
 - e. Fire Glazing.
 - 1) Fire protective glazing.
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for those alternates effecting work of this Section.
 - 2. Section 081113 "Hollow Metal Doors and Frames" for vision light glass in hollow metal frames and doors.
 - 3. Section 084113 "Aluminum Framed Entrances and Storefronts."
 - 4. Section 085613 "Transaction Windows."

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 units.

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 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 119: Fire Tests of Building Construction and Materials.
- B. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.
- C. Consumer Product Safety Commission (CPSC):
 - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials, Category II.

1.5 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.
 - 3. Review drawings for locations and details of glazing.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.7 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
 - 1. For security "forced entry resistant" glass, include UL listing verification and UL-752 Test Results.
 - 2. For security "forced entry resistant" glass, include manufacturer's written installation and cleaning instructions.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square. Submit the samples listing glass type corresponding to Glass Legend indicated on Drawings and as follows:
 - 1. Tinted Fully Tempered Monolithic Float Glass.
 - 2. Laminated Glass.
 - 3. Insulated Glass.
 - 4. Insulated Fully Tempered Glass.
 - 5. Fire Glazing:
 - a. Fire-resistive glazing products.
 - b. Fire protective glazing products.
- C. Fire-Rated Window/Wall Framing Samples: For each of the following:
 - 1. Sample of steel frame, not less than 6 inches in length.
 - 2. Sample of aluminum cover cap, not less than 6 inches in length and in finish specified.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. 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.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Installers.
 - 2. Manufacturers of insulated glass units with low-E coatings.
 - 3. Glass testing agency.
 - 4. Sealant testing agency.

- B. Product Certificates: For each type of glass and glazing product, from manufacturer. For glass.
- C. Product Test Reports: For 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.

1.9 CLOSEOUT SUBMITTALS

- A. Warranties: Sample of special warranties.

1.10 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- E. Security Glazing Testing Agency Qualifications: Subject to compliance with requirements, testing agency is one of the following:
 - 1. H. P. White Laboratory, Inc.
 - 2. Underwriters Laboratories, Inc.
 - 3. Wiss, Janney, Elstner Associates, Inc.
- F. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
- G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- H. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in related Sections indicated below to match glazing systems required for Project, including glazing methods.
 - a. Section 084113 "Aluminum-Framed Entrances and Storefronts".
 - b. Section 085113 "Aluminum Windows."
 - 2. Install security glazing in mockups specified in related Sections indicated below to match glazing systems required for Project, including security glazing methods.
 - a. Section 084113 "Aluminum-Framed Entrances and Storefronts."
 - b. Section 085113 "Aluminum Windows."
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 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.

1.12 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.
- B. Environmental Limitations for Fire Glazing: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.13 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.
- D. Manufacturer's Special Warranty for Security Glass: Manufacturer agrees to replace security glass that deteriorates within specified warranty period. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced standard, yellowing, and loss of light transmission.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. 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 insulating glass from single source from single manufacturer.
 - 3. Obtain laminated glazing from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each laminated glazing type.
 - 4. Obtain security glazing from single source from single manufacturer using the same types of lites, plies, interlayers, and spacers for each security glazing type.
- B. 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.
 - 1. Installed security glazing shall withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing. Design glass, including comprehensive engineering analysis according to the ICC's International Building Code (IBC) listed on Drawings and ASTM E 1300 by a qualified professional engineer, using design criteria set forth in Article 2.2 and as follows:
 - 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.
 - 3. Design Snow Loads: As indicated on Drawings.
 - 4. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 5. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 - 6. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with enhanced-protection testing requirements in ASTM E 1996 for Wind Zone indicated on Structural Drawings when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.
 - 1. Large-Missile Test: For glazing located within 30 feet of grade.
 - 2. Small-Missile Test: For glazing located more than 30 feet above grade.
- 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.
 - 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.
 - 7. Self-ignition temperature of 650 deg F or more when tested according to ASTM D 1929 on plastic sheets in thicknesses indicated for the Work.
 - 8. Smoke-Developed Index of 450 or less when tested according to ASTM E 84, or smoke density of 75 or less when tested according to ASTM D 2843 on plastic sheets in thicknesses indicated for the Work.
 - 9. Burning extent of 1 inch or less when tested according to ASTM D 635 at a nominal thickness of 0.060 inch or thickness indicated for the Work.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

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: "Glazing Manual."
 - 2. GANA Publications: "Laminated Glazing Reference Manual"
 - 3. 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 Safety Glazing Certification Council (SGCC) or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Fire-Resistive-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.
- D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- E. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: 6.0 mm, except where specifically indicated otherwise.
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- F. Strength:
 - 1. Where float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - 2. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article.
 - 3. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Monolithic Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultra Clear Monolithic Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent
- C. Tinted Annealed Monolithic Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- D. 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.
- E. Fully-Tempered Monolithic 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.
- F. Low-E-Coated Vision Glass: Coated by pyrolytic process or vacuum deposition (sputter-coating) process, and complying with other requirements specified.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products listed below or comparable products from other manufacturers meeting specified requirements, and which are submitted to and accepted by Architect prior to bidding.
 - a. Vitro; "Solarban 70 Solar Control (formerly Solarban 70 XL)"
 - 1) Low-E coating and Tint color selected shall match existing at each project site as determined by Architect and Owner.

2. Kind: Kind CV (coated vision glass).
 3. Glass: Clear and tinted float. Refer to Glass Types Schedule at end of this Section.
 4. Performance Criteria: Refer to Glass Types Schedule at end of this Section.
- G. Pyrolytic-Coated, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.
1. Basis-of-Design Product: Subject to compliance with requirements, provide products listed below or comparable products from other manufacturers meeting specified requirements, and which are submitted to and accepted by Architect prior to bidding.
 - a. Vitro Architectural Glass;
- H. Glass Types: Refer to Glass Type Schedules at end of this Section.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with the following interlayer types to comply with interlayer manufacturer's written instructions.
 - a. Polyvinyl butyral interlayer.
 - b. Ionomeric polymer interlayer.
 - c. As required to provide fire resistive glass types or fire protective glass types indicated.
 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 3. Interlayer Color: Clear unless otherwise indicated.
 4. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated Glass Schedule" at end of this Section.
- B. Glass Types: Refer to Glass Type Schedules at end of this Section.

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 seals, respectively.
 2. Perimeter Spacer: Aluminum with black, color anodic finish .
 3. Desiccant: Molecular sieve or silica gel, or a blend of both.
- B. Glass Types: Refer to Glass Type Schedules at end of this Section.

2.7 FIRE-RESISTIVE-RATED GLAZING

- A. Fire-Resistive-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing according to ASTM E 119 or UL 263.
1. "W" denotes installed locations that must meet wall assembly criteria per ASTM E119.
 2. "OH" denotes installed locations that must meet fire window assembly criteria per NFPA 257.
 3. "D" denotes installed locations that must meet fire door assembly criteria per NFPA 252.
 4. "H" denotes installed locations that must meet fire door assembly hose stream test per NFPA 252.
 5. "T" denotes installed locations that must meet temperature rise requirement per NFPA 252.
 - a. Fire-resistance-rated glazing is tested the same as a wall assembly is tested and can be used in fire-resistance-rated walls. Size is limited only by size that was used in test.
- B. Fire-Resistive-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.
- C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.

2.8 FIRE-PROTECTIVE-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.
 - 1. "W" denotes installed locations that must meet wall assembly criteria per ASTM E119.
 - 2. "OH" denotes installed locations that must meet fire window assembly criteria per NFPA 257.
 - 3. "D" denotes installed locations that must meet fire door assembly criteria per NFPA 252.
 - 4. "H" denotes installed locations that must meet fire door assembly hose stream test per NFPA 252.
 - 5. "T" denotes installed locations that must meet temperature rise requirement per NFPA 252.
- B. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II and ASTM E119. Label shall be/meet W120 in accordance with the latest edition of the International Building Code, as adopted by the authority having jurisdiction. Rating shall not be less than 2 hours (120 minutes).
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Pilkington "Pyrostop", or comparable meeting specified requirements submitted to and accepted by Architect prior to bidding.
- C. Fire-Protective-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
 - 1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.
- D. Fire-Protective-Rated Tempered Glass: 6-12-mm thickness, fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.
- E. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 5-mm thickness; faced on one surface with a clear glazing film; and complying with 16 CFR 1201, Category II.
- F. Laminated Ceramic Glazing: Laminated glass made from two plies of clear, ceramic glass; 8-mm total thickness; and complying with 16 CFR 1201, Category II.
- G. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
- H. Double Glazing Units with Clear Gel Fill: Double glazing units made from two lites of uncoated, fully tempered, ultraclear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent gel; and complying with 16 CFR 1201, Category II.
- I. Glass Types: Refer to Glass Type Schedules at end of this Section.

2.9 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - 1. EPDM complying with ASTM C 864.
 - 2. Silicone complying with ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM or silicone gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- C. Fire-Rated Glazing: Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
 - 1. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written

instructions for selecting glazing sealants suitable for applications indicated.

- a. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.10 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. Provide glazing sealants that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
3. 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.
4. Security Glazing Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
5. 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.
6. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

C. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

1. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

D. Security Sealant: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement complying with ASTM C 920, Grade NS, Class 12.5 or 25, Use NT, and with a Shore A hardness of at least 45 when tested according to ASTM C 661.

2.11 GLAZING TAPES

A. General: Provide glazing tapes that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. 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.

C. 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.

2.12 MISCELLANEOUS GLAZING MATERIALS

A. General:

1. 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.

2. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- 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.
 - G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.13 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, ambient; 180 deg F, 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.
 1. Provide ground and polished edges for glass doors and shelving at display cases.
 2. Provide ground and polished edges for glass shelving at merchandising walls.

2.14 FABRICATION OF SECURITY GLAZING

- A. Fabricate security glazing 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.
- B. Grind smooth and polish exposed security glazing 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. Minimum required bite.
 - a. No less than 1/2" on all 4 sides.
 5. 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.
 - 1. Use methods approved by testing agencies that listed and labeled fire-resistive glazing or fire-protective glazing products.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 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 minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior face exterior or interior as specified.
- K. Set glass lites with proper orientation so that security films face exterior face exterior or interior as specified.
- L. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.
- M. 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.
- N. 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 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces 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.
- F. Remove excess glazing film mounting solution at finished seams, perimeter edges and adjacent surfaces. Use cleaning methods recommended by glazing film manufacturer. Remove and replace films that cannot be cleaned.

3.8 HEAT TREATED MONOLITHIC GLASS SCHEDULE

- A. Glass Type 11 - Clear Fully Tempered monolithic float glass (088000.A11):
 - 1. 1/4 inch (6 mm).
 - 2. Visible Light Transmittance: 85 percent minimum.
 - 3. Provide safety glazing labeling.
- B. Glass Type 12 - Clear Fully Tempered monolithic float glass (088000.A12):
 - 1. 3/8 inch (9.5 mm).
 - 2. Visible Light Transmittance: 85 percent minimum.
 - 3. Provide safety glazing labeling.

3.9 LAMINATED GLASS SCHEDULE

- A. Glass Type 21 - Clear laminated glass. (088000.A21)
 - 1. Basis-of-Design Product: Vitro Architectural Glass
 - 2. Two plies of fully tempered float glass.
 - 3. Minimum Thickness of Each Glass Ply: 6mm.
 - 4. Interlayer Thickness: 0.060 inch.
 - 5. Safety glazing required.

3.10 INSULATING GLASS SCHEDULE

- A. Glass Type 33 - Low-E-coated, tinted insulating glass (088000.A33)
 - 1. Overall Unit Thickness: 1 inch (24 mm).
 - a. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
 - 2. Outdoor Lite: Heat strengthened tinted sputter-coated float glass.
 - a. Low-E Basis of Design Product:
 - 1) Vitro Architectural Glass; "Solarban 70 Solar Control (formerly Solarban 70 XL)"
 - b. Low-E Coating: Sputter coated on second surface.
 - c. Tint Color: Subject to compliance with requirements, provide one of the following products:
 - 1) Vitro Architectural Glass.; Pacifica.
 - 2) Vitro Architectural Glass.; Solarblue.
 - 3) Vitro Architectural Glass.; Azuria.
 - 4) Vitro Architectural Glass.; Solexia.
 - 5) Vitro Architectural Glass.; Atlantica.
 - 6) Comparable products, with the following product characteristics, from other manufacturers may incorporated if submitted to and accepted by Architect prior to bidding.
 - 3. Interspace Content: Air.
 - 4. Indoor Lite: Heat strengthened clear float glass.
 - 5. Product Characteristics:
 - a. Visible Light Transmittance: 50 percent minimum.
 - b. Visible Light Reflectance (Exterior): 10 percent.
 - c. Winter Nighttime U-Factor (air): 0.28 maximum.
 - d. Solar Heat Gain Coefficient: 0.24 maximum.

- e. Light-to-Solar Gain Ratio (LSG): 2.08 minimum.

3.11 INSULATING FULLY-TEMPERED GLASS SCHEDULE

- A. Glass Type 43 - Low-E-coated, tinted fully tempered insulating glass (088000.A43)
 - 1. Overall Unit Thickness: 1 inch (24 mm).
 - a. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
 - 2. Outdoor Lite: Fully tempered tinted sputter-coated float glass.
 - a. Low-E Basis of Design Product:
 - 1) Vitro Architectural Glass; "Solarban 70 Solar Control (formerly Solarban 70 XL)"
 - b. Low-E Coating: Sputter coated on second surface.
 - c. Tint Color: Subject to compliance with requirements, provide one of the following products, as selected by the Architect:
 - 1) Vitro Architectural Glass.; Solarblue.
 - 2) Vitro Architectural Glass.; Atlantica.
 - 3) Vitro Architectural Glass.; Solarbronze.
 - 4) Vitro Architectural Glass.; Solexia.
 - 5) Vitro Architectural Glass.; Solargray.
 - 6) Comparable products, with the following product characteristics, from other manufacturers may incorporated if submitted to and accepted by Architect prior to bidding.
 - 3. Interspace Content: Air.
 - 4. Indoor Lite: Fully tempered clear float glass.
 - 5. Product Characteristics: Meet manufacturer's minimum and maximum characteristics per Tint + Clear Solarban 70 Solar Control Low E Glass selected by Architect.
 - 6. Safety glazing required.

3.12 FIRE PROTECTIVE GLAZING SCHEDULE

- A. Glass Type 74 - Fire-Protective 20-Minute Rated Tempered Glass. (088000.A74)
 - 1. Glass Type 74.
 - 2. 1/4-inch-thick, fire-protection-rated tempered glass, complying with testing requirements in 16 CFR 1201 for Category II materials. Non-heat conductive and 20-minute rating minimum. Fire protective label per IBC shall be D-20.
 - 3. Basis of Design Products: Provide one of the following products:
 - a. Technical Glass Products; "Fireglass 20".
 - b. Safti First; "SuperLite I - 20".
 - c. McGrory Glass; "FireDefend 20".
- B. Glass Type 75 - Fire-Protective-Rated 45-Minute Interior Glass. (088000.A75)
 - 1. Glass Type 75.
 - 2. Multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials. Product shall be non-heat conductive and have fire protection rating of not less than 45 minutes. Fire protective label per IBC shall be D-H-OH-45.
 - 3. Subject to compliance with requirements, provide products from one of the following:
 - a. Pilkington Group Limited (distributed by Technical Glass Products).
 - b. Safti First.
 - c. SCHOTT (distributed by McGrory Glass).
 - d. Vetrotech Saint-Gobain.

END OF SECTION 088000

SECTION 092116 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions (092116.A01).
 - 2. Suspension systems for interior ceilings, bulkheads, soffits, and exterior soffits.
 - a. For spans exceeding 8 feet in any direction refer to Section 054000 for design requirements.
 - 3. Grid suspension systems for gypsum board ceilings (092116.A06).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for description of alternates affecting work of this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

1.3 INFORMATIONAL SUBMITTALS

- 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.
- B. Evaluation Reports: For embossed steel studs and runners and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated or where not specifically indicated, as specified below, according to ASTM E 119 by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance-rated assemblies identical to those specified by reference to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction. Design designation from UL are minimum requirements. Where more stringent requirements are indicated or specified, the more stringent requirements shall take precedence.
 - a. Refer to Section 008400 "Attachments" for UL fire-rated assemblies.
 - b. One Hour non-load bearing partitions: UL U 465.
 - c. Two Hour non-load bearing partitions: UL U 411.
- 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. Horizontal Deflection: For wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 or coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners (092116.A01): ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.0179 inch.
 - b. Provide 0.0296 inch minimum base metal thickness for studs and runners at walls indicated to receive tile, walls indicated to receive abrasion-resistant drywall, impact-resistant drywall, and at other locations indicated.
 - c. Depth: 3-5/8 inches, unless otherwise indicated.
 - 2. Embossed Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.0147 inch.
 - b. Provide 0.025 inch minimum base metal thickness for studs and runners at walls indicated to receive tile, walls indicated to receive abrasion-resistant drywall, impact-resistant drywall, and at other locations indicated.
 - c. Depth: 3-5/8 inches, unless specifically indicated otherwise.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit over inside runner and one gauge heavier than gauge for wall construction indicated.
 - 2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: Top runner 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.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.0296 inch.
- F. Furring Channels (Furring Members) (09216.A03):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
- 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.
 - 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 (092116.A02): ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0179 inch.
 - 2. Depth: 7/8 inch, unless specifically indicated otherwise.
- I. Z-Shaped Furring (092116.A04): With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Hanger Attachments to Concrete:
 - 1. Anchors: Capable of sustaining a load equal to 5 times that imposed as determined by ASTM E488.
 - a. Type: Post installed, chemical anchor or post-installed, expansion anchor.

2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
 - C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
 - D. Carrying Channels (092116.A05:): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges, 3/4 inch deep. Hot-dip galvanize carrying channels in exterior locations to at least G40 requirements.
 1. Depth: 2 inches.
 - E. Grid Suspension System for Gypsum Board Ceilings and Soffits (092116.A06): At Contractor's option, pre-manufactured grid suspension systems may be used. Grid suspension system shall comply with ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; 640/660 Drywall Ceiling Suspension.
 - c. United State Gypsum Company; Drywall Suspension System.
 - F. Furring Channels (Furring Members) (09216.A03) :
 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
 - G. Hat-Shaped, Rigid Furring Channels (092116.A02): ASTM C 645, 7/8 inch deep.
 1. Minimum Base-Metal Thickness: 0.0179 inch.
 - H. Z-Shaped Furring (092116.A04): With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Vertical Isolation Strips at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
- C. Isolation Strips beneath Runner Tracks at Exterior Walls: Provide the following:
 1. Polyethylene-sheet-backed rubberized asphalt membrane, 40 mils thick. Field cut to match widths of runners.
- D. Resilient Sound Isolation Clips: Subject to compliance with requirements, provide "RSIC-1" by PAC International or a comparable product submitted to and accepted by Architect prior to bidding with the following product characteristic.
 1. Rubber Isolator
 - a. Natural and Manufactured rubber compound
 - b. Molded to isolate ferrule from clip
 - c. Minimum of 12 micro-vibration controlling pedestal at point of contact with framing member.
 - d. Manufactured to ASTM D2000, M2 AA 510 A13, which includes:
 - 1) Hardness, ASTM D2240, Shore A: 47 min
 - 2) Modulus 300 Percent, ASTM D412, Die C: 5.3 MPa.
 - 3) Tensile Strength, ASTM D412, Die C: 11.2 MPa
 - 4) Elongation at Break, ASTM D573: 454 percent.
 2. Clip: Galvanized or aluminum-zinc coated steel, 16 gauge.

3. Ferrule: Zinch-electroplated steel.
 4. Projection: 1-5/8 inches from supporting structure, when 7/8-inch drywall furring channels are used.
- E. Deck-Suspended Ceiling Hangers: Subject to compliance with requirements, provide Kinetics Noise Control; "ICC Deck-Supported Ceiling Isolation Hanger". Comparable products from other manufacturers will be considered.
1. Hanger shall include a 1-inch rated deflection spring in series with a neoprene cup.
 2. Hanger shall be equipped with a clip/leveling rod assembly, designed to receive a 16 gauge steel carrying channel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
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: 16 inches o.c. unless otherwise indicated.
 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 3. Tile Backing Panels: 16 inches o.c. 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. Where runner tracks for exterior walls are installed directly against concrete or dissimilar metals, install rubberized asphalt isolation strips between bottom of runner track and concrete.
- D. Install studs so flanges within framing system point in same direction.

- E. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts 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 runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs, having a minimum base metal thickness of 0.0296 inches, at each jamb.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- F. 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 o.c.
- G. 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 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 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 from corner and cut insulation to fit.
- H. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SOUND ISOLATION CLIPS AND CEILING HANGERS

- A. Install ceiling hangers, resilient sound isolation clips and drywall furring channels in accordance with manufacturer's written instructions.
 - 1. Locate resilient sound isolation clips maximum of 8 inches from ends of dry wall furring channels.
- B. Mechanically fasten resilient sound isolation clips to structure with screws, bolts, or expansion anchors, dependent upon structure.
- C. Fire-Resistive Design Assemblies:
 - 1. Install as specified in UL Fire Resistance Directory, where required.
 - 2. Do not arbitrarily add resilient sound isolation clips to fire-rated assemblies.
- D. Space resilient sound isolation clips at maximum of 24 inches by 48 inches on center for walls and ceilings.
- E. Do not exceed design load (pull and shear) of 36 pounds per isolation clip.
- F. Stagger isolation clip installation, so dead load is supported by all support members.
- G. Space ceiling hangers as recommended by manufacturer.
 - 1. Do not exceed design load (pull and shear) of ceiling hanger.
- H. Splicing Drywall Furring Channels:
 - 1. Splice drywall furring channels with minimum of 6-inch (150-mm) laps.
 - 2. Secure laps with 2 framing screws or 18 gauge tie wire double wrapped.

3. Locate splices between resilient sound isolation clips.
 4. Do not locate splices on resilient sound isolation clips.
- I. Install resilient sound isolation clips on 1 side of wall assembly, unless otherwise indicated on the drawings.
- J. Flanking Noise:
1. Review installation details to prevent structure-borne flanking noise.
 2. Do not allow drywall furring channels or gypsum board to contact foreign materials, including floors, ceilings, or wall framing members.
- K. Ensure metal ferrule of resilient sound isolation clips is in firm contact with structural member.
- L. Gypsum Board:
1. Install gypsum board in vertical or horizontal position with 1/8-inch to 1/4-inch gap around perimeter for acoustical sealant application.
 2. Install gypsum board in accordance with ASTM C 840 as specified in Section 092900.
- M. Acoustical Sealant:
1. Seal potential air leaks with acoustical sealant to achieve best Field Sound Transmission Class (FSTC).
 2. Seal electrical outlets and penetrations with acoustical sealant.
 3. Apply fire-rated acoustical sealant at locations where fire-rated assembly is required.
- N. Putty Pad Sealant: Acoustically seal with putty pads, electrical boxes in walls and ceilings in which resilient sound isolation clips are used.

3.6 INSTALLING SUSPENSION SYSTEMS

- A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- 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 measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092116

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SECTION 092900 - GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - a. Gypsum Board, Type X (092900.A02).
 - b. Mold-Resistant Gypsum Board (092900.A06).
 - 2. Tile backing panels (092900.A10).
 - 3. Expansion control joint (092900.A12).
 - 4. Sound attenuation blankets (092900.A14).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for description of alternates effecting work of this Section.
 - 2. Section 092116 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
 - 3. Division 26 Sections for electrical connections to lighting components within trim pieces.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- C. Samples for Verification: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

- A. Integrated Field Sample: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution for Level 5 areas.
 - 1. Build integrated field sample for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written 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. Ceiling and wall materials 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."

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Lafarge North America, Inc.
 - 4. National Gypsum Company.
 - 5. USG Corporation.
- B. Gypsum Board, Type X (092900.A02): ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Mold-Resistant Gypsum Board (092900.A06): ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units (092900.A10): ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products or a comparable product, with the following product characteristics, submitted to and accepted by Architect prior to bidding.
 - a. C-Cure.; C-Cure Board 990
 - b. National Gypsum Company.; Permabase Cement Board.
 - c. USG Corporation.; DUROCK Cement Board.
 - 2. Thickness: 5/8 inch.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim (092900.A11): ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - a. At Contractor's option, interior trim may be a structural laminate drywall corner system using "No-Coat" products as manufactured by Certainteed or a comparable product submitted to and accepted by Architect prior to bidding.
 - 2. Shapes:
 - a. Cornerbead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.
 - c. J-Bead: J-shaped; exposed short flange does not receive joint compound.
 - d. Expansion (control) joint.
 - e. Wall end cap: Provide "Fast Cap" as manufactured by Trim-Tex Drywall Products.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
 - 3. Cementitious Backer Units: As recommended by backer unit 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 drying-type, all-purpose compound.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
 - a. Where specifically indicated on Drawings, provide a setting-type, sandable topping compound for trowel-applied skim coat.
- D. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 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. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Laminating 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."
- 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 thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

- E. Sound-Attenuation Blankets (092900.A14): 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 of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- F. Acoustical Impaling clips (092900.A14): Galvanized sheet metal impaling clips each with 8 spikes that stick onto the fiberglass and hold the panel in place; 2-1/8" x 1-1/2"; install by either drywall screws or attached with adhesive as recommended by the manufacturer.
- G. Acoustical Joint Sealant (092900.A15): Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following products or a comparable product, with the following product characteristics, submitted to and accepted by Architect prior to bidding.
 - a. Accumetric LLC.; BOSS 824 Acoustical Sound Sealant.
 - b. Pecora Corporation.; AIS-919.
 - c. USG Corporation.; SHEETROCK Acoustical Sealant.

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 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. 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-wide joints to install sealant.
 - 4. Where ceilings in showers abut adjacent walls, Provide 1/4- to 3/8-inch-wide spaces and trim edges with plastic edge trim to allow for sealant.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-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. Type X: Vertical and horizontal surfaces of walls, soffits, bulkheads and ceiling surfaces unless otherwise indicated.
- 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 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.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11
 - 1. Locations:
 - a. At shower ceiling locations and vertical surfaces indicated to receive tile
 - b. At showers, tubs, and where indicated
 - c. At locations indicated to receive tile.
- B. 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.
 - 2. L-Bead: Use where indicated.
 - 3. U-Bead: Use at exposed panel edges.
- D. Aluminum Trim: Install in locations indicated on Drawings.
- E. Wall-to-Mullion Sound Seals: Install according to manufacturer's written instructions at 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 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
 - 3. Level 5:
 - a. Provide at the following locations:
 - 1) At walls perpendicular to exterior glazing.
 - 2) Down Light / Wall Washers
 - 3) Where indicated on Drawings.
 - b. Primer and its application to surfaces are specified in Other Division 09 Sections.
- E. Cementitious Backer Units: 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 092900

SECTION 093000 - TILING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glazed wall tile (093000.A01).
 - 2. Waterproof membrane. (093000.A03).
 - 3. Crack isolation membrane.
 - 4. Metal edge strips (093000.A04).
 - 5. Tile Base (093000.A05).
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 092900 "Gypsum Board" for cementitious backer units.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and, in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, ANSI A108.17, 108.18, 108.19, 108.20, A118, A136 which are contained in its "Specifications for Installation of Ceramic Tile."
- C. ANSI A 137.1, American National Standard Specifications for Ceramic Tile.
- D. ANSI A 137.2, American National Standard Specifications for Glass Tile.
- E. ANSI A 37.3, American National Standards Specifications for Gauged Porcelain Tile and Gauged Porcelain Tile Panel/Slabs.
- F. ANSI A 138.1, American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles, and Tile Installation Materials.
- G. Face Size: Actual tile size, excluding spacer lugs.
- H. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.60.

1.5 ACTION SUBMITTALS

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

- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 - 1. Show extent and locations for waterproof membrane and crack isolation membrane.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish one unopened box, but not more than 2 percent, for each type, composition, color, pattern, and size indicated.

1.8 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Crack isolation membrane.
 - 2. Joint sealants.
 - 3. Metal edge strips.
- D. Installer Qualifications:
 - 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 - 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
 - 3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
- E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of wall tile installation.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Mockups/Field Samples: Build mockups/field samples to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups/field samples of each type of restroom wall tile installation. Mockup/field sample shall extend to floor to demonstrate transition from wall to floor.
2. Build mockups/field samples of each type of wall tile installation.
3. Approved mockups/field samples may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store liquid materials in unopened containers and protected from freezing.
- D. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 1. Level Surfaces: Minimum 0.60.

2.2 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type from single source or producer.
 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 1. Metal edge strips.

2.3 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements.

- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.4 CERAMIC TILE PRODUCTS

- A. Tile Type (093000.A01 – **T1**): Glazed ceramic wall tile.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Dal-tile; "Classic - Color Wheel Collection."
 - a. Comparable products from other manufacturer's, meeting specified requirements, colors and shape, will be considered when submitted to and accepted by Architect prior to bidding.
 - 2. Composition: Vitreous or impervious natural clay or porcelain, glazed ceramic.
 - 3. Size: 3x6 inches (7.65cm x15.31cm).
 - 4. Thickness: 5/16 inch.
 - 5. Face: Pattern of design indicated, with cushion edges.
 - 6. Tile Colors and Pattern: As indicated by manufacturer's designations on Material Finish Legend for tile Type T1.
 - 7. Grout Color: As specified later in this Section.
 - 8. Tile Trim: Provide the following types:
 - a. (093000.A05) Tile Cove Base: #A3601, 6 x 6 inches where indicated on drawings - **TB1**
 - 9. Top Edge Trim:
 - a. Top Edge Trim: Provide Schluter; "Jolly", refer to Paragraph 2.8 D of this Section.

2.5 WATERPROOF MEMBRANE AND CRACK ISOLATION MEMBRANE (093000.A03)

- A. Fluid-Applied Waterproofing/Crack Isolation Membrane: Liquid-latex rubber or elastomeric polymer.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Laticrete; "Hydro Ban" waterproofing and crack isolation membrane. Comparable products from other manufacturers will be considered when submitted to and accepted by Architect prior to bidding.
 - 2. Product Description and Characteristics:
 - a. Single component, self-curing liquid rubber polymer that forms a flexible and seamless membrane.
 - b. Thickness: Not less than 0.020 inches when cured.
 - c. Anti-fracture protection up to 1/8 inch.
 - d. Extra Heavy Service rating per TCNA.
 - 3. Adhesives shall have a VOC content of 65 g/L or less.
 - 4. 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."

2.6 SETTING MATERIALS

- A. Improved Modified Dry-Set Mortar (Thinset and LHT Mortars): ANSI A118.15.
 - 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 2. For large & heavy tile (LHT) use mortar meeting LHT requirements.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

2.7 GROUT MATERIALS

- A. High-Performance Polymer-Modified Tile Grout - Type **TGR1**: Meeting or exceeding ANSI A118.7. Grout shall be chemical and stain resistant type. Polymer modified with ethylene vinyl acetate or acrylic additive, in dry, re-dispersible form, pre-packaged with other dry ingredients. Grout shall be fast setting, highly stain resistant, crack and shrink resistant, and mold /mildew resistant.
1. Basis-of-Design Product: LATICRETE International, Inc., "Permacolor Grout" or comparable product from other manufacturers listed below, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
 - a. Ardex.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. MAPEI.
 - e. Mer-Kote Products, Inc.
 - f. Southern Grouts & Mortars, Inc.
 - g. Summitville Tiles, Inc.
 - h. TEC; a subsidiary of H. B. Fuller Company.
 2. Grout Color: As selected by Architect.
- B. Water-Cleanable High Performance Epoxy Grout: ANSI A118.3, with a working time not less than 80 minutes, equipped with anti-microbial technology and a full cure time of 14 days at 70 degrees F, and with a VOC content of 65 g/L or less.
1. Basis-of-Design Product: LATICRETE International, Inc., "Permacolor Grout" or comparable product from other manufacturers listed below, meeting specified requirements, submitted to and accepted by Architect prior to bidding.
 - a. Ardex.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. MAPEI.
 - e. Mer-Kote Products, Inc.
 - f. Southern Grouts & Mortars, Inc.
 - g. Summitville Tiles, Inc.
 - h. TEC; a subsidiary of H. B. Fuller Company.
 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg. F. and 212 deg. F., respectively, and certified by manufacturer for intended use.
 3. Grout Color: As selected by Architect.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Cementitious Coating for Walls: Powdered formulated made from special rapid-setting and hydrating binders, graded silica sand, synthetic resin, and special additives.
1. Basis of Design Product: Subject to compliance with requirements provide "Ultratop Loft W" by Mapei.
 - a. Technical Data:
 - 1) Consistency: Fine powder.
 - 2) Color: White or Natural.
 - 3) Bulk Density: 900 Kg/m3.
 - 4) Dry solids content: 100%.
 - 5) Mixing ratio: approx. 32-35 parts of water per 100 parts of weight of Ultratop Loft W.
 - 6) Density of mix: 1,600 Kg/m3.
 - 7) PH of mix: 11.
 - b. Finish: In order to protect and made a non-absorbent surface, apply an undercoat of Ultratop Base Coat followed by a finishing product from the Manufacturer's floor finish range and as approved by Architect.
- B. Rapid Set Pre-Tiling Mortar: mortar shall be designed for both interior and exterior use and shall be non-sag type.
1. Basis-of-Design Product: Ardex; "AM 100 Rapid Set" or comparable product submitted to and accepted by Architect prior to bidding.
 2. Locations for Use: Provide as a ¼ inch thick leveling mortar over interior concrete unit masonry walls indicated to receive tile.

- C. Metal Edge Strips (093000.A04): Profile as specified below, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring and wall applications; white zinc alloy or Type 316 L stainless-steel, ASTM A 666, 300 Series exposed-edge material. Provide Schluter profiles as follows:
 - 1. Type **TR1**: Schluter; "Quadec" satin anodized aluminum straight-edge profile for outside corner trim profile at all outside wall corners of wall tile and at all top cap of wall tile.
 - 2. Type **TR2**: Schluter; "Jolly" satin anodized aluminum straight-edge profile for the outside edges of tiled surfaces on walls transitioning to another material.
 - a. Size: To be selected from manufacturers full range.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, pre-coat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in stacked grid pattern, unless otherwise indicated. Lay tile Type **T1** in a straight stacked pattern as indicated on Interior Elevation Drawings. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Wall Tile (Tile Type **T1**): 1/8 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
 - 1. Terminate top of wainscot decorative metal edge trim.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- H. Grout Sealer: Apply grout sealer to cementitious grout joints in the wainscot according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
 - 1. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations (except wet walls), Metal Studs or Furring:
 - 1. Tile Installation: Thin-set mortar on cementitious backer unit; TCNA W244C-18.
 - a. Tile Type: **T1,TB1**
 - b. Thin-Set Mortar: Latex-portland cement mortar.
 - c. Grout: High performance grout.
- B. Interior Wall Installations (Wet Walls), Metal Studs or Furring:
 - 1. Tile Installation: Thin-set mortar on cementitious backer unit; TCNA W244C-18.
 - a. Tile Types: **T1,TB1**
 - b. Thin-Set Mortar: Latex-portland cement mortar over liquid waterproofing.
 - c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Acoustical ceiling panels (095113.A01).
 - 2. Ceiling suspension systems (095113.A02).
 - 3. Edge Molding and Trim (095113.A03).
- B. Related Requirements:
 - 1. Section 012300, "Alternates" for alternates effecting work of this section.
 - 2. Division 26 Sections for electrical requirements.

1.2 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: One 6 inch square Sample of each type, color, pattern, and texture.

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. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Installer Qualifications: Submit written certification of compliance with requirements.
- C. Qualification Data: For testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.
- E. Product test reports.
- F. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Furnish two, unopened boxes of each type installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.
 - 5. Single Tee Adapter Clips: Equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with not less than three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.
- B. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Section 01 31 00.
- C. Testing Agency Qualifications: Qualified according to NVLAP.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Ceiling 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."
- 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: Comply with ASTM E 1264 for Class A materials.

2. Smoke-Developed Index: 50 or less.
- C. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Source Limitations:
 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- E. Metal Suspension System Standard: Comply with ASTM C 635.

2.3 ACOUSTICAL PANELS (095113.A01)

- A. Recycled Content for Acoustical Panels: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product specified hereinafter or comparable product, meeting specified requirements, by one of the following:
 1. Acoustical Ceiling Units:
 - a. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - b. Armstrong World Industries, Inc.
 - c. Certainteed, Saint-Gobain.
 2. Metal Suspension Systems, Edge Moldings and Decorative Edge Trim:
 - a. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - b. Armstrong World Industries, Inc.
 - c. Certainteed, Saint-Gobain.
 - d. Chicago Metallic Corporation.
 - e. Gordon, Inc.
- C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as specified.
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL CEILING PANELS

- A. Acoustical Ceiling Panels, (095113.A01 – **CLG1**): Provide humidity resistant, square lay-in, mineral fiber ceiling panels with the following characteristics:
 1. ASTM E 1264 Classification: Type III, Form 2, Pattern C, E.
 2. Sizes: 24" x 48" x 5/8".
 3. Color: Refer to Material Finish Legend.

4. Average light reflectance (LR): 0.83.
5. Noise reduction coefficient (NRC): 0.55.
6. Ceiling attenuation class (CAC): 35.
7. Articulation class (AC): N/A
8. Flame Spread/Fire Resistance: Class A.
9. Product warranty: 30 years.
10. Suspension System: USG DX
11. Basis of Design Product: Provide USG; "Radar", lay-in ceiling panel #2310

2.5 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content for Suspension Grid: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
 1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. 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.
 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Post-installed expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so 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, provide not less than 0.106-inch-diameter wire.
- E. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For vestibule and corridor ceilings adjacent to exterior doors, provide hold-down clips spaced 2'-0" o.c. on all cross-tees for a radius of 10 feet from center of door.
- G. Impact Clips: In all toilet provide manufacturer's standard impact clip system design to absorb impact forces against lay-in panels.
- H. Hemmed Edge Molding: Provide prefinished edge molding of profiles indicated. Finish to match adjacent suspension grid.
- I. Fixture Trim: Provide manufacturer's standard fixture trim for fixtures within the 4 by 4 ceiling panels.
 1. Color to match suspension trim.

2.6 METAL SUSPENSION SYSTEM (095113.A02)

- A. Wide-Face, Capped, Double-Web, fire-rated, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
 1. Structural Classification: Intermediate-duty system.

2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet, except in kitchen and food preparation areas provide aluminum.
5. Cap Finish: As indicated on Material Finish Legend.
6. Basis of Design:
 - a. Profile: USG "DX/DXL" as indicated on Material Finish Legend.

2.7 METAL EDGE MOLDINGS AND TRIM (095113.A03)

- 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. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- B. Basis of Design Product of Transition Molding: Subject to compliance with requirements provide "DONN Brand SL DXT" by USG Interiors, Inc.; Subsidiary of USG Corporation No Substitutions Allowed.

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, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- 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 and, if permitted with fire-resistance-rated ceilings, 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 either to structures 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. 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.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. 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.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. 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, and comply with layout shown on reflected ceiling plans.
1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
- D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. At areas indicated, 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, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim, unless acceptable to Architect.
- F. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. 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 a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 4. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For vestibule ceilings adjacent to exterior doors, provide hold-down clips spaced 2'-0" o.c. on all cross-tees for a radius of 10 feet from center of door.
 5. Impact Clips: In all toilet and locker rooms, provide manufacturer's standard impact clip system design to absorb impact forces against lay-in panels.

3.4 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. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base (096513.A01).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for alternates effecting work of this section.
 - 2. Section 033000 "Cast-in-Place Concrete."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturers' standard-size Samples, but not less than 12 inches long.

1.3 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 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 or more than 90 deg F.

1.5 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive resilient products during the following time 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 or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.1 THERMOSET-RUBBER BASE (096513.A01 - **RB1**)

- A. Basis-of-Design Product: Subject to compliance with requirements, Tarkett: "Baseworks Wall Base" or comparable product from one of the following:

1. Johnsonite Corporation.
 2. Kentile.
 3. Mercer Plastics Co, Inc.
 4. R.C. Musson Rubber Co.
 5. Roppe
- B. Product Standard: ASTM F 1861, Type TS (rubber, thermoset).
1. Group: 1 (solid, homogeneous).
 2. Style: As indicated on Material Finish Legend.
- C. Product Characteristics:
1. Thickness: 0.125 inch.
 2. Height: 4 inches as indicated on Drawings.
 - a. Type "TSB-4": 4 inches as indicated on Drawings.
 3. Lengths: Coils in manufacturer's standard length.
 4. Outside Corners: Pre-formed.
 5. Inside Corners: Job formed.
 6. Colors: As indicated by manufacturer's designations on the Material Finish Legend.

2.2 RUBBER MOLDING ACCESSORY (096513.A06)

- A. Description: Reducer strips for carpet to resilient flooring transitions, nosing for carpet, nosing for resilient flooring, joiner for tile and carpet, and transition strips.
- B. Locations: Provide rubber molding accessories in areas indicated.
- C. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and suitable for substrate conditions indicated.
1. Adhesives shall 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. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.
- C. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.5 METAL TRANSITION STRIP INSTALLATION

- A. Install metal transition strips where indicated. Securely anchor in place with mechanical fasteners as recommended by transition strip manufacturer.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes resilient tile flooring (096519.A01) of the following types:
 - 1. Luxury vinyl floor tile.
 - 2. Solid vinyl floor tile.
- B. Related Sections:
 - 1. Section 012100 "Allowances" for allowances effecting work of this Section.
 - 2. Section 012200 "Unit Prices" for unit prices effecting work of this Section.
 - 3. Section 096513 "Resilient Base and Accessories" for related base and floor transitions.
 - 4. Section 096813 "Tile Carpeting" for related flooring.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Floor patterns and transition strip locations.
 - 2. Layout, colors, widths, and dimensions of game lines and markers.
 - 3. Seam locations for sheet flooring.
- C. Samples for Verification: Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than 6-by-9-inch sections.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. For qualified flooring Installer.
 - 2. For qualified flooring manufacturer.
- B. Preparation and Installation Guidelines: For each type of resilient flooring, including current subfloor preparation guidelines in addition to installation guidelines published by flooring manufacturer.
- C. Slab Moisture Testing Results: Refer to Part 3 of this Section.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.
- B. Warranty:
 - 1. Manufacturer material warranty.
 - 2. Installer installation warranty.

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. Floor Tile: Furnish one un-opened box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. ISO 9001 Certified.
 - 2. ISO 14001 Certified.
 - 3. At least ten years active experience in the manufacture and marketing of indoor resilient flooring.
 - 4. A provider of authorized installer training.
 - 5. Must be competent in techniques required by manufacturer for resilient flooring installation indicated.
- B. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required and shall have at least five years' experience.
- C. Mockups/Field Samples: Build mockups/field samples to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups/field samples for floor tile including resilient base and accessories.
 - a. Size: Minimum 50 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups/field samples does not constitute approval of deviations from the Contract Documents contained in mockups/field samples unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Fire Test Characteristics: As determined by testing identical products according to ASTM E 648, Class 1, by a qualified testing agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
- B. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

- A. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
 - 1. After post-installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
 - 2. Close spaces to traffic during flooring installation.
 - 3. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
- B. Install floor tile after other finishing operations, including painting, have been completed.

1.9 WARRANTY

- A. Special Limited Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace resilient flooring that fails within specified warranty period.
 - 1. Material warranty direct from the product manufacture and not a separate or third party insurance provider.
 - 2. Failures include, but are not limited to, the following
 - a. Material manufacturing defects.
 - b. Surface wear and deterioration to the point of wear-through.

- c. Failure due to substrate moisture exposure not exceeding 5 pounds moisture vapor emission rate when tested according to ASTM F 1869, and 80 percent relative humidity when tested according to ASTM F 2170.
- 3. Warranty Period:
 - a. For materials and workmanship: 2 years from date of Substantial Completion.
 - b. For surface wear: 15 years from date of Substantial Completion.
 - 1) Luxury vinyl floor tile. - 10 years from date of Substantial Completion.
 - 2) Solid vinyl floor tile - 20 years from date of Substantial Completion.
- B. Special Limited Warranty: Installer's standard form in which installer agrees to repair or replace sports flooring that fails due to poor workmanship or faulty installation within the specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE (096519.A01 – **RF1**)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide "Timeless V5011" by JJ Flooring Group.
 - 1. Tile Standard: ASTM F 1700.
 - a. Class: Class III, printed film vinyl plank.
 - 2. Product Characteristics:
 - a. Thickness: 5 mm
 - b. Size: 9 inches by 48 inches.
 - c. Finish/Coating: Enhanced UV Urethane with Ceramic Bead
 - d. Pattern Repeat: Random Wood pattern.
 - e. Backing Class: Commercial Grad
 - 3. Product Warranty: 10 years.
 - 4. Performance Characteristics:
 - a. Static Load Limit: Passes, modified at 750 psi when tested according to ASTM F 970.
 - 5. Colors and Patterns: As indicated by manufacturer's designations on Material Finish Legend.
 - 6. Adhesive: J+J LVT adhesive, Commercialon® Premium

2.3 SOLID VINYL FLOOR TILE (096519.A01 – **RF2**)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Tarkett, Inc; "iQ Granit SD," Static dissipative pressed homogeneous vinyl flooring. Comparable products from other manufacturers will be considered, which match color and pattern selected to Architect's satisfaction and, are submitted to and accepted by Architect prior to bidding.
 - 1. Tile Standard: ASTM F 1700.
 - a. Class: Class I, Type A performance Solid Vinyl Tile
 - 2. Product Characteristics:
 - a. Thickness: 0.080 inch (2.0 mm)
 - b. Size: 24 inches by 24 inches.
 - 3. Performance Characteristics:
 - a. Static Load Limit: Not less than 250 psi when tested according to ASTM F 970.
 - 4. Colors and Patterns: As indicated by manufacturer's designations on Material Color Schedule.
 - 5. Installation: Quarterturn

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by tile flooring and adhesive manufacturers for each type of tile flooring. Adhesive shall be suitable for substrate conditions involved and compatible with flooring.
 - 1. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Topical Concrete Vapor Sealer: Liquid penetrating type or film-forming type, designed to seal concrete and inhibit moisture transmission through slab. Concrete vapor sealers shall be as recommended by resilient tile flooring contractor based upon successful previous installations and as acceptable to resilient tile flooring manufacturer. Refer to Section 012200 "Unit Prices".
- D. Metal Transition Strips: Provide pre-manufactured aluminum edging, 3/8 inch high by 2-1/2 inches wide in manufacturer's standard lengths and in longest lengths practical.
 - 1. Basis-of-Design Product: Gradus; "Model RT247". Comparable products matching profile and characteristics of specified product will be considered.
 - 2. Fasteners: Provide post-installed expansion anchors with Type 304 stainless steel countersunk fasteners.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by carpet tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by carpet tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing (Contractor's Option):
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, unless a higher rate is accepted by flooring manufacturer in writing.
 - 1) Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
 - b. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement, unless a higher rate is acceptable to flooring manufacturer.

- C. Concrete Vapor Sealer Application: Prepare surfaces to receive concrete vapor sealer and apply concrete vapor sealer in strict accordance with vapor sealer manufacturer's written instructions to suit slab moisture conditions encountered.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate according to manufacturer's written instructions.
 - 1. Fill cracks 1/8 inch wide and wider, fill and level holes and depressions 1/4 wide or wider and grind level all protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis, unless specifically indicated otherwise.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay luxury vinyl tiles with grain running in one direction.
 - 2. Lay solid vinyl tiles in a quarter -turn method.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - RESINOUS FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes seamless resinous flooring systems (096723.A01) with integral base (096723.A02).
- B. Related Sections:
 - 1. Section 012200 "Unit Prices" for waterproofing membrane.
 - 2. Section 096513 "Resilient Base and Accessories".

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. Review layout and patterns.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required; in addition to the following:
 - 1. List each material and cross-reference the specific coating, finish system and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Laboratory Test Reports: For resinous flooring systems, documentation indicating that products 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".
- B. Samples for Verification: Prior to beginning work, submit samples for each resinous flooring system color, texture and sheen required and as follows:
 - 1. Samples shall be 6 inches square, applied to a rigid backing by Installer for this Project.
 - 2. Resubmit samples as requested until required sheen, color and texture is acceptable to Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Submit certificates signed by manufacturer certifying that installers comply with specified requirements, in addition to the following:
 - 1. Submit substantiating evidence of experience installing the specific brand of products proposed in similar areas, in addition to meeting Installer Qualification criteria.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated. Installer shall be/have been trained by flooring system manufacturer with experience in application and installation of systems similar in complexity to those required for this project, in addition to the following:

1. Installer shall have a minimum of two (2) years continuous experience under the current company name.
 2. Installer shall submit a reference list of at least three (3) projects, similar in size and applied system(s), completed in the states of Missouri Include contact information for General Contractor or Construction Manager and Owner. List types and names of systems installed, each material/component of system(s) installed, quantity installed and dates completed.
- B. Mockups/Field Samples: Build mockups/field samples to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups/field samples in conjunction with the wall tile mock-up installation. Mockup/field sample shall extend to floor to demonstrate transition from wall to floor.
 2. Approved mockups/field samples may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components. Include handling instructions and precautions.
- B. Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 45 deg F in a well-ventilated area. Maintain containers in clean condition, free from foreign material and residue.
1. Protect liquid components from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary precautionary measures to ensure workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of floor systems.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
1. Do not commence work until the building can be maintained at a temperature range between 60 deg F and 90 deg F for 48 hours before, during and 48 hours after application. Broom clean areas (reasonably dust free) and have adequate controlled ventilation.
 2. Maintain ventilation in each area indicated to receive resinous flooring until completion of the resinous flooring work in that area.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.
- D. Surfaces to receive resinous flooring must be acceptable and in accordance with flooring system manufacturer's recommendations.
1. Provide clean, dry, and neutral substrate for resinous flooring application.
 2. Notify Owner's Representative in writing of unsuitable surfaces and conditions. Commencement of work implies acceptance of surfaces and working conditions.

1.9 PROTECTION

- A. Protect adjacent surfaces from damage resulting from work of this trade. If necessary, mask and/or cover adjacent surfaces, fixtures, cabinetry, equipment, etc. by suitable means.
- B. Post "NO SMOKING" signs while work is in progress and during curing.

1.10 SPECIAL WARRANTY

- A. Contractor, manufacturer and installer have responsibility for an extended corrective period for work of this Section for a period of three (3) years from date of Substantial Completion against all conditions indicated below, and when notified in writing by Owner, Contractor/manufacturer/installer shall promptly and without inconvenience and cost to the Owner, correct said deficiencies in compliance with the requirements of the Conditions of the Contract.
 - 1. Flooring system manufacturer and Installer shall co-sign warranty and shall be responsible for:
 - a. Bond failure of system(s) to substrate.
 - b. System yellowing, including regionalized discoloration.
 - c. Excessive wear.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Flooring system 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."
- B. Flammability: Self-extinguishing according to ASTM D 635.
- C. Slip Resistance: Resinous flooring surfaces shall have the following minimum performance requirements as indicated below.
 - 1. Static Dry Coefficient of Friction: 0.6 minimum per ASTM D2047.
 - 2. Dynamic Wet Coefficient of Friction: 0.45 minimum per ANSI A326.3 or ANSI B101.3.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, body coats, and topcoats, from single source from single manufacturer to ensure material compatibility, chemical and mechanical bond; quality of materials, color and pattern consistency. Obtain secondary materials, including patching and fill material, color chips/flakes and granules, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.3 RESINOUS FLOORING (096723.A01 – **FT1**)

- A. Basis-of-Design Product: Subject to compliance with specified requirements, provide DESCO Coatings, Inc.; "Cremona TG" with aliphatic urethane topcoat resinous flooring system or one of the resinous flooring systems listed below.
 - 1. Dur-A-Flex; "DUR-A-Quartz Q11" with aliphatic urethane topcoat.
 - 2. Comparable products from manufacturers listed below and other manufacturers which meet or exceed specified requirements will also be considered when submitted to and accepted by Architect as a substitution prior to bidding only.
- B. Resinous Flooring System: System shall be a trowel-applied, abrasion-, UV-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base. System shall be capable of being applied over an existing epoxy resinous floor.
- C. System Characteristics:
 - 1. Color and Pattern: As noted on Material Finish Schedule.
 - 2. Wearing Surface: Orange-peel texture to match approved sample.
 - a. Slip resistance shall not be less than performance requirements indicated in this Section.
 - 3. Overall System Thickness: Not less than 3/16 inch.
- D. Primer: Provide manufacturer's recommended primer to suit substrate and resinous flooring system indicated.

1. Formulation Description: 100 percent solids.
- E. Binder and all successive grout and top coats shall be 100% solids clear/epoxy resin. Ceramic coated quartz aggregates as supplied by Desco Coatings are to be used to achieve all color. No pigmented epoxy base or top coats allow
- F. Body Coats:
 1. Resin: Epoxy.
 2. Formulation Description: 100 percent solids.
 3. Type: Clear or colored to suit design mix selected.
 4. Application Method: Self-leveling slurry with broadcast aggregates.
 5. Aggregates: Colored quartz (ceramic-coated silica).
 - a. Quartz aggregate shall be Grade 11.
- G. Topcoats: Sealing or finish coats.
 1. Resin: Aliphatic Urethane.
 2. Formulation Description: High solids.
 3. Type: Clear.
 4. Number of Coats: As required to achieve overall system thickness specified and texture selected.
 5. Finish Texture and Sheen: Match sample approved by Owner's Representative.
- H. Integral Cove Base: Provide integral coved base of height indicated with 1 inch radiused cove and bullnosed top edge termination. Provide keyed joint where resinous flooring terminates with other materials.
- I. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
 1. Compressive Strength (System): 10,200 psi minimum according to ASTM C 579.
 2. Tensile Strength: 1,650 psi minimum according to ASTM C 307.
 3. Bond Strength: 425 psi minimum according to ASTM D 4541.
 4. Abrasion Resistance: .08 mg maximum weight loss according to ASTM D 4060.
 5. Hardness: 85-90 Shore D according to ASTM D 2240.
 6. Flame Spread/NFPA 101: Class A according to ASTM E 84.
 7. Cure Time @ 77 degrees: 10-12 hours.
- J. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected when tested according to ASTM D 1308 for 50 percent immersion in the following reagents for no fewer than seven days:
 1. Hydrochloric Acid (20%)
 2. Urine.
 3. Coffee
 4. Ethyl Alcohol
 5. Lactic Acid (10%)
 6. Tea
 7. Mustard
 8. Mercurochrome
 9. Betadine

2.4 ACCESSORIES

- A. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
 1. Formulation Description: Manufacturer's standard high solids.
 - a. Provide fiberglass scrim embedded in reinforcing membrane.
- B. Transition Strip: Provide pre-manufactured two-piece edging.
 1. Material: PVC-u top and aluminum base.
 2. Overall Height: 9mm.
 3. Width: Top - 42mm, base - 28mm.
 4. Color: As selected from manufacturers full range.
 5. Basis-of-Design/Product: Gradus "RT42/AFT28"
 6. Fasteners: Provide post-installed expansion anchors with Type 304 stainless steel countersunk fasteners.
 - a. Provide all fasteners and accessories necessary for secure and proper installation.

- C. At top of resinous wall base provide the following product. Colors shall match existing at project site as determined by Architect. Height of trim shall match thickness of resinous flooring system.
 - 1. Basis of Design Product: "Jolly" by Schluter.
- D. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- E. Joint Sealant: Type recommended or produced by manufacturer of resinous flooring system for type of service and joint condition indicated.
- F. Waterproofing Membrane: When required by manufacturer for a successful installation over project site conditions, provide and install a fluid applied moisture barrier membrane, to prevent excessive moisture/humidity conditions, allowing a fully warranted floor installation.
 - 1. Vapor barrier to allow 100% relative humidity at the floor surface, while maintaining the manufacturer's full warranty.
 - 2. Refer to Section 012200 "Unit Prices".

PART 3 EXECUTION

3.1 EXAMINATION

- A. Contractor shall examine subfloor surfaces to verify all substrates and conditions are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, curing compounds, and other adhesives and coatings that may inhibit bonding capability of resinous flooring and primer, as well as other defects that may impair performance and appearance.

3.2 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
 - 1. Areas where flooring is existing, must be cleaned to remove all floor material, adhesives, grease or any residue that may interfere with interfacial adhesion between substrate and new resinous flooring system.
 - 2. Prepare concrete substrates by shot blasting or grinding to achieve surface profile recommended by resinous flooring manufacturer.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, adhesives, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 - 3. Moisture testing is not required. However, Contractors at their own expense may, as they deem necessary, verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
 - b. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.
 - 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - 1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- E. Metal Transition Strips: Install at locations indicated and between resinous flooring and concrete. Transition strip may be used as a screed. Thicken resinous flooring application as necessary so flooring is flush with top of transition strip. Installation shall be in strict accordance with edging manufacturer's written recommendations.

3.3 APPLICATION

- A. Proceed with resinous flooring work after subfloor surfaces are satisfactory. Commencement of resinous flooring work is construed as Installer's acceptance of substrate surfaces within a particular area.
 - 1. Coordinate work within this section with adjacent finish work to achieve full coverage of each finish as required by each section.
- B. Apply components of resinous flooring system according to manufacturer's latest written instructions, employing technically-trained, approved mechanics, to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
 - a. Do not fill moving isolation joints or expansion joints.
 - b. At movement joints, provide membrane isolation strips and reinforcing tape as recommended by resinous flooring manufacturer.
- C. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- D. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.
 - 1. Fill non-moving control joints with approved elastomeric sealant or full-depth semi-rigid two-component epoxy joint filler, designed specifically for this purpose (use full-depth semi-rigid joint filler when reinforcement of the joint edge is desirable), or two-component epoxy and filler (epoxy to be same material as flooring).
- E. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.
- F. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.
- G. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.
- H. Cure resinous flooring in compliance with flooring manufacturer's directions to prevent contamination during all stages of application.
- I. Finish work shall match approved samples; be uniform in thickness, sheen, color and texture; and be free of defects detrimental to appearance and performance.
- J. Install metal transition strips where resinous flooring abuts other flooring materials. Securely anchor in place with mechanical fasteners as recommended by transition strip manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Material Sampling: Owner's Representative may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.

3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Core Sampling: At the direction of Owner's Representative and at locations designated by Owner's Representative, take one core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.
- C. Touch-up or repair damaged coatings. Touch-up shall not be visibly different. Recoat entire surface if touch-up results are visible, either in sheen, texture or color.

3.5 CLEANING AND PROTECTION

- A. Clean resinous flooring prior to Substantial Completion. Use materials and procedures recommended by resinous flooring manufacturer.
- B. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.
 1. Remove any temporary covering prior to cleaning and final inspection.

END OF SECTION 096723

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SECTION 096813 - TILE CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes modular carpet tile (096813.A01).
- B. Related Requirements:
 - 1. Section 012200 "Unit Prices" for waterproofing membrane.
 - 2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. Review carpet tile layout and patterns.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Type of substrate to receive tile carpeting.
 - 3. Type of installation.
 - 4. Pattern of installation.
 - 5. Pattern type, location, and direction.
 - 6. Carpet tile type, color and dye lot.
 - 7. Type, color and location of insets and borders.
 - 8. Type, color and location of edge, transition, and other accessory strips.
 - 9. Transition details to other flooring materials.
- C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- E. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 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. Carpet Tile: Furnish one un-opened box of each carpet tile type, color and pattern for every 5 percent of amount installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- C. Mockups/Field Samples: Build mockups/field samples to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups/field samples for carpet tile including accessories.
 - a. Size: Minimum 50 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups/field samples does not constitute approval of deviations from the Contract Documents contained in mockups/field samples unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.

1.9 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 CARPET TILE (096813.A01)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products specified on drawings or a comparable products meeting specified requirements, having similar colors and patterns as acceptable to Architect with the following characteristics submitted to and accepted by Architect prior to bidding.
1. Refer to Material Finish Legend for carpet selections including name, manufacturer, and installation pattern.
- B. Carpet Type **C1**: Subject to compliance with requirements, provide "Runway II Walk-off Modular" 7267 by J+J Flooring.
1. Product Construction: Textured Loop.
 2. Dye Method: Solution Dyed
 3. Fiber Type: Encore^(R) SD (with Recycled content).
 4. Face Weight: 34 oz/sy.
 5. Total Thickness: 0.375 inches.
 6. Pile Density: 6607 oz/yd.
 7. Stiches: 9 per inch.
 8. Radiant Panel: ASTM E-648 Class 1.
 9. Smoke Density: ASTM E-662 ≤ 450.
 10. Primary Backing: Nexus^(R) Modular.
 11. Soil / Stain Protection: Manufacturer's standard with warranty.
 12. Size: 24 inch by 24 inch Standard
 13. Color and Pattern: As indicated on Material Finish Legend.
 14. Installation Method: As indicated on Material Finish Legend.
- C. Carpet Type **C2**: Subject to compliance with requirements, provide "Galaxy 7719" by J+J Flooring
1. Product Construction: Patterned Loop.
 2. Dye Method: Solution Dyed
 3. Fiber Type: Encore^(R) SD Ultima^(R) (with Recycled content).
 4. Face Weight: 23 oz/sy.
 5. Pile Thickness: 0.25 inches.
 6. Pile Density: 9196 oz/yd³.
 7. Stiches: 10 per inch.
 8. Radiant Panel: ASTM E-648 Class 1.
 9. Smoke Density: ASTM E-662 ≤ 450.
 10. Primary Backing: Nexus^(R) Modular.
 11. Soil / Stain Protection: Manufacturer's standard with warranty.
 12. Size: 18 inch by 36 inch Standard
 13. Color and Pattern: As indicated on Material Finish Legend.
 14. Installation Method: As indicated on Material Finish Legend.
- D. Carpet Type **C3**: Subject to compliance with requirements, provide "Cosmos 7720" by J+J Flooring.
1. Product Construction: Pattern Loop.
 2. Dye Method: Solution Dyed
 3. Fiber Type: Encore^(R) SD Ultima^(R) (with Recycled content).
 4. Face Weight: 24oz/sy.
 5. Total Thickness: 0.25 inches.
 6. Pile Density: 9303 oz/yd.
 7. Stiches: 10 per inch.
 8. Radiant Panel: ASTM E-648 Class 1.
 9. Smoke Density: ASTM E-662 ≤ 450.
 10. Primary Backing: Nexus^(R) Modular.
 11. Soil / Stain Protection: Manufacturer's standard with warranty.
 12. Color and Pattern: As indicated on Material Finish Legend.
 13. Installation Method: As indicated on Material Finish Legend.
 14. Commercialon Premium Modular Adhesive

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type. Select adhesives suitable for substrate conditions and compatible with flooring and backing. Adhesives shall comply with flammability requirements for installed carpet tile and be recommended by carpet tile manufacturer for releasable installation.
 - 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."
- C. Adhesive Tape: Tile Carpeting manufacturer's recommended adhesive tape to suit backing type and substrates involved. Basis-of-Design Product: "TandusTape."
- D. Resilient Transition Strips: Refer to Section 096513 "Resilient Base and Accessories" and Interior Material Finish Legend for information and products for use at carpet transitions.
- E. Metal Edge/Transition Strips: Extruded aluminum with anodize aluminum finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
 - 1. Fasteners: Provide post-installed expansion anchors with Type 304 stainless steel countersunk fasteners.
- F. Topical Concrete Vapor Sealer: Liquid penetrating type or film-forming type, designed to seal concrete and inhibit moisture transmission through slab. Concrete vapor sealers shall be as recommended by tile carpeting Contractor based upon successful previous installations and as acceptable to tile carpeting manufacturer.
 - 1. Refer to Section 012200 "Unit Prices".
 - 2. Basis of Design Product: Subject to compliance with requirements, provide "Vaporseal HM Plus" by Dependable Floor Products, or a comparable product acceptable to Architect and carpet tile manufacturer, with the following product characteristics:
 - a. Permeance: Less than 0.1 perms when applied at 11 mills (dry film thickness) per ASTM E96.
 - b. Moisture Barrier for slabs up to 100 percent relative humidity per ASTM F2170 and/or 25 pounds MVER per ASTM 1869.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer.
 - 1. Access Flooring Systems: Verify the following:
 - 2. Access floor substrate is compatible with carpet tile and adhesive if any.
 - 3. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's

written instructions.

- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by carpet tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by carpet tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing of Existing Slabs:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, unless a higher rate is accepted by flooring manufacturer in writing.
 - 1) Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
 - b. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement, unless a higher rate is acceptable to flooring manufacturer.
- E. Concrete Vapor Sealer Application: When concrete vapor sealer is required, prepare surfaces to receive concrete vapor sealer and apply concrete vapor sealer in strict accordance with vapor sealer manufacturer's written instructions to suit slab moisture conditions encountered.
 - 1. Concrete vapor sealer shall be applied as base bid for installation of carpet over existing concrete slabs.
- F. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. **Installation Method:**
 - 1. At perimeter of each room/area: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
 - 2. In field of room/area (inside glued down perimeter): install tiles with factory-applied releasable, pressure-sensitive adhesive strips.
- C. Installation Layout: As indicated on Material Finish Legend.
- D. Maintain dye lot integrity. Do not mix dye lots in same area.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- H. Install pattern parallel to walls and borders.
- I. Metal Transition Strips: Install at locations indicated and between carpet tile and adjacent finishes. Installation shall be in strict accordance with edging manufacturer's written recommendations.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097723 - FABRIC WRAPPED PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Shop-fabricated, fabric-wrapped wall panels (097723.A01 – **WP2**).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.
- B. Shop Drawings: For fabric-wrapped wall panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- C. Samples for Verification: For each type of fabric facing from fabric-wrapped, wall panel manufacturer's full range.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fabric-wrapped wall panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain fabric-wrapped wall panels from single source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide fabric-wrapped wall panels meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84, Class A.
- C. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Mockup: Build mockup to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area as indicated by the architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and fabric-wrapped, wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fabric-wrapped wall panels until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install fabric-wrapped wall panels until a permanent level of lighting is provided on surfaces to receive fabric-wrapped wall panels.
- C. Air-Quality Limitations: Protect fabric-wrapped wall panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of fabric-wrapped wall panels and actual dimensions of openings and penetrations by field measurements before fabrication.
 - 1. Verify locations of switch plates and other similar items penetrating fabric-wrapped wall panels.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped wall panels that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Fabric sagging, distorting, or releasing from panel edge.
 - b. Delamination from wall substrate.
 - c. Warping of core.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Wall materials 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."
- B. Fire-Test-Response Characteristics: Panels shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. 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.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 FABRIC-WRAPPED WALL PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnegie

2. Conwed.
 3. Decoustics Limited; a CertainTeed Ceilings company.
 4. Golterman & Sabo.
 5. Lamvin, Inc.
 6. Signature Craft.
 7. Wall Technology, Inc.; an Owens Corning company.
- B. Fabric-Wrapped Wall Panel (097723.A01): Manufacturer's standard panel construction consisting of fabric facing material laminated to front face, edges, and back edge border of core.
1. Mounting: Back mounted with manufacturer's standard adhesive supplemented with impaling clips, secured to substrate.
 - a. Impaling clips shall be mechanically fastened to substrate.
 2. Core: mineral-fiber board.
 3. Edge Profile: Square.
 4. Corner Detail in Elevation: Square with continuous edge profile indicated.
 5. Facing Material (**WP2**): Carnegie Fabrics Inc, Pulse.
 - a. Colors as indicated on Material Finish Legend.
 - b. Fire Performance Characteristics: Class A per ASTM E 84.
 - c. Contents: 100 percent Recycled Polyester.
 - d. Weight: 12.5 oz/ly.
 6. Nominal Overall Panel Thickness: 2 inches.
 7. Panel Width: As indicated on Drawings.
 8. Panel Height: As indicated on Drawings.

2.3 MATERIALS

- A. Core Materials:
1. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of 20 lb/cu. ft. (320 kg/cu. m).
 - a. Basis of Design: Provide Micore MC300-SC with coated face as manufactured by USG or a comparable product.
 - b. Joint Treatment Material: As recommended by mineral fiber board manufacturer to create smooth uniform joints between core panels that will not telegraph through facing material.
- B. Facing Material: Fabric from same dye lot; color and pattern as indicated on Drawings.
- C. Mounting Devices: Concealed on back of panel, utilize adhesive supplemented with impaling clips as recommended by manufacturer to support weight of panel, and as follows:
1. Adhesives: As recommended by fabric-wrapped, wall panel manufacturer.
 - a. Adhesives shall have a VOC content of 70 g/L or less.
 - b. 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."
 2. Impaling Clips: Manufacturer's standard.

2.4 FABRICATION

- A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Mineral-Fiber Board Cores: Chemically harden core edges and areas of core where mounting devices are attached.
- C. Facing Material: Apply fabric fully covering visible surfaces of panel; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
1. Square Corners: Tailor corners.
 2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.

- D. Dimensional Tolerances of Finished Panels: Plus or minus 1/16 inch (1.6 mm) for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated panels, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of fabric-wrapped wall panels.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fabric-wrapped wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
 - 1. For monolithic installation, adhere core to wall substrate, treat panel joints and apply liner material to entire surface to receive facing material. Install wall liner, with no gaps or overlaps, to form a smooth wrinkle-free surface for finished installation. Do not begin facing material installation until wall liner has dried.
- B. Comply with fabric-wrapped, wall panel manufacturer's written instructions for installation of panels using adhesive type mounting supplemented with impaling devices indicated. Mount panels securely to supporting substrate.
- C. Align and level fabric pattern and grain among adjacent panels.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch.
- B. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 097723

SECTION 099113 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of exterior paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. EIFS (Exterior Insulation and Finish System)
 - 7. Steel doors and frames.
 - 8. Miscellaneous mechanical, electrical, plumbing, fire suppression, communication and technology work as delineated in this section.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
 - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
 - 4. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
 - 5. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 6. Section 099123 "Interior painting" for surface preparation and the application of paint systems on interior substrates.
 - 7. Section 099600 "High-Performance Coatings" for special-use coatings.

1.2 DEFINITIONS

- A. Gloss Level 1 "Matte": Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3 "Eggshell": 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4 "Satin-like": 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5 "Semi-gloss": 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6 "Gloss": 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7 "High Gloss": 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. Indicate VOC content.
- B. Samples for Initial Selection: Where colors are not indicated on Drawings, submit 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: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas.
 - 2. Use same designations indicated on Drawings and in schedules.
 - 3. Include color designations.
 - 4. VOC content.

1.4 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.
- B. 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. Paint: Two (2) gallons of each material and color applied.
 - 2. Draw downs of each color and type used to be included in O&Ms.
 - 3. Identify using the same designation as found on the finish schedule in the operations and maintenance manual.
 - 4. Two new boxes of each type of acoustical tile, to be painted by contractor, to match newly painted tile to be stored at each school.

1.5 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.

1.6 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.

1.7 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 - Basis of Design Products: Subject to compliance with requirements, provide products scheduled by The Sherwin-Williams Company, or comparable products from other manufacturers submitted to and accepted by Architect and Owner prior to bidding.

2.2 PAINT, GENERAL

- A. 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.
- B. VOC Content: For field applications, 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. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- C. Colors: Where not indicated on Drawings, as selected by Architect from manufacturer's full range.
 - 1. Twenty percent of surface area will be painted with deep tones.
- D. Paint Systems: Refer to schedule at end of this Section.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may 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. Wood: 15 percent.
 5. Gypsum Board: 12 percent.
- C. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
 - D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
 - E. 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 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, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 1. SSPC-SP 3.
- 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. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 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.
 5. For existing wood substrates, pressure wash as recommended by in writing by topcoat manufacturer. Pressure wash at lowest pressure possible as to not damage wood substrate.

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. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. 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.
- E. Miscellaneous Painting of Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - 1) Also includes gas lines on roof.
 - c. Uninsulated plastic piping.
 - 1) Also includes PVC condensate lines on roof.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Traffic Paint:
1. The Sherwin-Williams Company.
 - a. 1st Coat: S-W Conflex Flexible Concrete Waterproof, A5 Series (Textured or Smooth)

- b. 2nd Coat: S-W Conflex Flexible Concrete Waterproofer, A5 Series (Textured or Smooth)
 - 1) (10-12 mils wet per coat)
- B. Concrete, including structural precast:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Loxon Concrete and Masonry Primer.
 - b. 2 coats Loxon Acrylic Masonry Coating, satin.
- C. Concrete, including structural precast – (Elastomeric, high build system not less than 10 mils):
 - 1. The Sherwin-Williams Company.
 - a. 2 coats Loxon XP High Build, satin (water vapor permeance of not less than 9 perms when tested according to ASTM D 1653).
- D. Steel Substrates - Unprimed:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane.
- E. Steel Substrates - Primed:
 - 1. The Sherwin-Williams Company.
 - a. 1 touchup coat Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane.
- F. Steel Substrates – Galvanized (except handrails and guardrails):
 - 1. The Sherwin-Williams Company.
 - a. 2 coats A-100 Latex, satin.
- G. Galvanized Steel Substrates – (except railings, handrails and guardrails):
 - 1. The Sherwin-Williams Company.
 - a. 1 touchup coat Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane.
- H. Primed Steel Doors and Frames:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane.
- I. Aluminum Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 2 coats A-100 Latex, satin.
- J. Aluminum Substrates – Gloss:
 - 1. The Sherwin-Williams Company.
 - a. 1 touchup coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane.
- K. Portland Cement Plaster (Stucco) Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Loxon XP Waterproof Coating.
 - b. 2 coats ConFlex XL High Build (smooth first coat and textured second coat).
- L. Exterior Gypsum Board Soffits Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 2 coats Loxon XP Waterproof Coating.
 - b. 2 coats ConFlex XL High Build (smooth first coat and textured second coat)

END OF SECTION 099113

SECTION 099123 - 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. Clay masonry.
 - 3. Concrete masonry units (CMUs).
 - 4. Steel and iron.
 - 5. Galvanized metal.
 - 6. Aluminum (not anodized or otherwise coated).
 - 7. Wood.
 - 8. Fiberglass.
 - 9. Plastic.
 - 10. Gypsum board.
 - 11. Miscellaneous mechanical, electrical, plumbing, fire suppression, communication and technology work as delineated in this Section.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
 - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
 - 4. Section 051200 "Structural Steel Framing" for shop priming structural steel.
 - 5. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 6. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 7. Section 099600 "High-Performance Coatings" for special-use coatings.

1.2 DEFINITIONS

- A. Gloss Level 1 "Matte": Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2 "Flat": Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3 "Eggshell": 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4 "Satin-like": 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5 "Semi-gloss": 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6 "Gloss": 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7 "High Gloss": 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. Indicate VOC content.
- B. Samples for Initial Selection: Where colors are not specifically indicated, submit 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 square.
 2. Label each coat of each Sample.
- D. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas.
 2. Use same designations indicated on Drawings and in schedules.
 3. Include color designations.
 4. VOC content.

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. Paint: 1 gallon of each material and color applied.

1.5 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.

1.6 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.

1.7 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 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 - Basis of Design Products: Subject to compliance with requirements, provide products by The Sherwin-Williams Company, or comparable products from other manufacturers submitted to and accepted by Architect and Owner prior to bidding.

2.2 PAINT, GENERAL

- A. 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.
- B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits for paints and paint colorants:
 - 1. Paints and Coatings: Less than 50 g/L.
 - 2. Colorants shall be 0 VOC.
- C. Low-Emitting Materials: 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."
- D. Colors: Where not indicated on Drawings, as selected by Architect from manufacturer's full range.
 - 1. Twenty percent of surface area will be painted with deep tones.
- E. Material Finish Schedule designations: As indicated on Material Finish Legend.
 - 1. Provide "flat" sheen for ceilings, unless otherwise specified.
- F. Provide "eggshell" sheen for walls, unless otherwise specified.
- G. Paint Systems: Refer to schedule at end of this Section.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may 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. Masonry (Clay and CMUs): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

- E. 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 applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, marker boards 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 all surface contamination such as 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.
 - 1. Wash previously painted surfaces with an abrasive cleanser and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer.
 - 2. Verify that chemical removal agents (if used) have been neutralized prior to installation of paint products.
- E. Masonry Substrates: Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence and sealers. Wash surfaces with an abrasive cleanser and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer.
 - 1. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Existing Brick Substrates: Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, efflorescence and sealers. Wash surfaces thoroughly. Where brick has been previously painted or sealed, wash surfaces with an abrasive cleanser and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas of previously painted brick with specified primer.
- G. 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 3.
- H. 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.
- I. 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.
- J. Aluminum Substrates: Remove loose surface oxidation.
- K. 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.
- L. Existing Substrates: Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Prepare substrates in accordance with paint manufacturer's recommendations to ensure adhesion.

3.3 APPLICATION

- A. Apply paints according to paint manufacturer's written instructions and to recommendations.
 - 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.
 - 6. Paint exposed air diffusers and grilles same color as adjacent wall or ceiling finish as directed by Architect.
 - 7. Mask off surfaces of doors prior to painting vision lite frames. Clean any excess paint from door surface to so that there is no evidence of excess paint remaining on door face and glass.
- 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. 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.
- F. Marking and Identification: Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other walls required to have protected openings and penetrations shall be permanently identified with stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor/ceiling or attic spaces;
 - 2. Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 - 3. Shall include lettering not less than 3 inches in height with a minimum 3/8-inch wide stroke in a contrasting color incorporating the following wording on the first line: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS".

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Wall Surfaces – Latex System:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat ProMar 200 Zero VOC Interior Latex Primer.
 - b. 2 coats ProMar 200 Zero VOC Latex, eggshell.
- B. CMU Substrates – Latex System:
 - 1. The Sherwin-Williams Company.
 - a. 1 touchup coat ProMar 200 Zero VOC Interior Latex Primer (spot prime bare areas).
 - b. 2 coats ProMar 200 Zero VOC Latex, eggshell.
- C. CMU Substrates – Epoxy System: Refer to Section 099600.
- D. Brick Substrates – Latex System:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Loxon Concrete and Masonry Primer.
 - 1) Spreading rates per coat: 5.3 - 8.0 mils wet, 2.1 - 3.2 mils dry.
 - b. 2 coats ProMar 200 Zero VOC Latex, eggshell.
- E. Steel Substrates – Non-primed:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial Acrylic.
- F. Steel Substrates – Non-primed:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane (semi-gloss).
- G. Steel Substrates – Pre-primed:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane.
- H. Steel Hollow Metal Doors and Frames (including doors, frames, metal glass stops, vision lite frames, astragals and metal louvers):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Industrial Enamel (Gloss)
- I. Steel Substrates (exposed metal decking, bar joists and exposed over-head structure) – Dryfall.
 - 1. The Sherwin-Williams Company.
 - a. 2 coats Pro Industrial Waterborne Acrylic Dryfall, eggshell.
- J. Galvanized-Metal Substrates (where not specifically indicated to be painted):
 - 1. The Sherwin-Williams Company.

- a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial Acrylic Coating, Eggshell.
- K. Galvanized-Metal Ductwork Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial Waterborne Acrylic Dryfall, eggshell.
- L. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat of Pro Industrial Pro-Cryl Universal WB Acrylic Primer.
 - b. 2 coats Pro Industrial WB Alkyd Urethane
 - 1) 2 coats Pro Industrial Acrylic.
- M. Gypsum Board Wall Substrates – Latex System:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat ProMar 200 Zero VOC Interior Latex Primer.
 - b. 2 coats ProMar 200 Zero VOC Latex, eggshell
- N. Gypsum Board Wall Substrates – Epoxy: Refer to Section 099600.
- O. Gypsum Board Wall and Ceiling Substrates indicated to receive Vinyl Wall Graphics – prepare per the wallcovering manufacturer's printed recommendations.
 - 1. The Sherwin-Williams Company.
 - a. 1 coat SuperPaint Interior Latex.
 - 1) 1 coat ProMar 200 Zero VOC Interior Latex Primer.
- P. Gypsum Board Wall and Ceiling Substrates indicated to receive Wall Covering – prepare per the wallcovering manufacturer's printed recommendations.
 - 1. The Sherwin-Williams Company.
 - a. 1 coat ProMar 200 Zero VOC Interior Latex Primer.
- Q. Wood Doors (Existing):
 - 1. The Sherwin-Williams Company.
 - a. Fill damaged areas and sand smooth
 - b. 1 coat Multi-Purpose Latex Primer.
 - 1) Prep and prime per topcoat manufacturer's recommendations.
 - c. 2 coats Acrolon HS 218-100, rolled.
 - 1) 2 coats Pro Industrial Acrylic.
- R. Wood Trim and Decorative Paneling (Opaque Finish):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Premium wall and wood primer.
 - 1) 1 coat Multi-Purpose Latex Primer.
 - b. 2 coats Acrolon HS 218-100, rolled.
 - 1) 2 coats Pro Industrial Acrylic.

END OF SECTION 099123

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SECTION 099600 - HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Concrete, vertical and horizontal surfaces
 - b. Steel
 - c. Galvanized metal
 - d. Aluminum (not anodized or otherwise coated)
 - e. Wood
 - f. Fiberglass
 - g. Portland cement plaster (stucco)
 - 2. Interior Substrates:
 - a. Cement board
 - b. Concrete masonry units (CMUs)
 - c. Steel
 - d. Galvanized metal
 - e. Gypsum board
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012200 "Unit Prices" for unit prices affecting work of this Section.
 - 3. Section 012300 "Alternates" for those alternates related to work of this Section.
 - 4. Section 051200 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
 - 5. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
 - 6. Section 099113 "Exterior Painting" for general field painting.
 - 7. Section 099123 "Interior Painting" for general field painting.

1.2 DEFINITIONS

- A. Gloss Level 3 "Eggshell": 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 5 "Semi-gloss": 35 to 70 units at 60 degrees, according to ASTM D 523.
- C. Gloss Level 6 "Gloss": 70 to 85 units at 60 degrees, according to ASTM D 523.
- D. Gloss Level 7 "High Gloss": 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. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
 - 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: For each product indicated, include the following:
 - 1. Cross-reference to coating system and locations of application areas.
 - 2. Use same designations indicated on Drawings and in schedules.
 - 3. Include color designations.
 - 4. VOC content.

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. Coatings: One (1) gallon of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated 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 coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
 - b. Pipe and Tube Railings: Paint at one section of railing.
 - c. 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.

1.6 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.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers - Basis of Design Products: Subject to compliance with requirements, provide products by The Sherwin-Williams Company, or comparable products from other manufacturers submitted to and accepted by Architect and Owner prior to bidding.

- B. Products: Subject to compliance with requirements, provide products listed in the Exterior High-Performance Coating Schedule and Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. 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.
 - 3. Products shall be of same manufacturer for each coat in a coating system.
- B. VOC Content: For field applications, 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. Primers, Sealers, and Undercoaters: 100 g/L.
 - 4. Rust-Preventive Coatings: 100 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - 6. Pretreatment Wash Primers: 420 g/L.
 - 7. Floor Coatings: 50 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- C. Low-Emitting Materials: 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."
- D. Colors: Where not indicated on Drawings, as selected by Architect from manufacturer's full range.
- E. Paint Systems: Refer to schedule at end of this Section.
- F. Material Finish Legend designations:
 - 1. Wall & Ceiling Finishes: 099600.A01, finishes **"HP1" through "HP2."**

2.3 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating 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 coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

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. Gypsum Board: 12 percent.
 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. 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 applicable to substrates and paint systems indicated.
1. Prepare previously painted surfaces indicated to receive new paint finish in strict accordance with paint manufacturer's written recommendations.
- 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 coatings, 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 coating systems indicated.
- D. Concrete Substrates: Remove all surface contamination such as 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.
1. Clean concrete by one of the following methods as recommended by paint manufacturer:
 - a. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
 - b. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4.
 2. Verify that chemical removal agents (if used) have been neutralized prior to installation of paint products.
- E. Masonry Substrates: Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence and sealers. Wash surfaces with an abrasive cleanser and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer.
1. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Existing Pre-Painted CMU Substrates: Clean and prepare as recommended by coating manufacturer.
- G. 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 3.
- H. 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.
- I. 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 coatings.
- J. Aluminum Substrates: Remove loose surface oxidation.
- K. Wood Substrates:
1. Scrape and clean knots. Before applying primer, apply coat of knot sealer that is recommended in writing by topcoat manufacturer for coating system indicated.

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 filler that is recommended in writing by topcoat manufacturer for coating system indicated. Sand smooth when dried.
- L. Existing Substrates: Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Prepare substrates in accordance with paint manufacturer's recommendations to ensure adhesion.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
1. Use applicators and techniques suited for coating and substrate indicated.
 2. 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.
 6. Paint exposed air diffusers and grilles same color as adjacent wall or ceiling finish as directed by Architect.
 7. Mask off surfaces of doors prior to painting vision lite frames. Clean any excess paint from door surface to so that there is no evidence of excess paint remaining on door face and glass.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
1. Contractor shall touch up and restore coated surfaces damaged by testing.
 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Concrete Substrates (Not subject to Pedestrian or Vehicular traffic):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Macropoxy 646-100
 - b. 1 coat Waterbased Acrolon 100 HS Acrylic Polyurethane.
- B. Galvanized Metal Bollards and Trash Enclosure Framing:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Macropoxy 646-100.
 - b. Pro Industrial DTM Acrylic.
 - c. Pro Industrial Acrylic
- C. Structural and Miscellaneous Steel (including service piping):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Macropoxy 646-100.
 - b. 1 coat Waterbased Acrolon 100 HS Acrylic Polyurethane.
- D. Steel Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Macropoxy 646-100.
 - b. 1 coat FluoroKem HS.
- E. Exposed Galvanized Structural Steel, Steel Joists and Miscellaneous Canopy Framing:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Pro Industrial Pro-Cryl Universal Primer.
 - b. 2 coats Pro Industrial Pre-Catalyzed Epoxy.
- F. Underside of Metal Roofing and back sides of Metal Fascia at Canopy:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Pro Industrial Pro-Cryl, universal water base primer.
 - b. 2 coats Pro Industrial Acrylic.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Exposed Structural Steel Columns and Framing:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Macropoxy 646-100.
 - b. 1 coat Waterbased Acrolon 100 HS Acrylic Polyurethane.
- B. Concrete and CMU Substrates - Epoxy System (non-wet walls):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Loxon Block Surfacers, 18 mils wet, 8 mils dry.
 - 1) 1 coat Pro Industrial Heavy-Duty Block Filler.
 - b. 2 coats Pro Industrial Pre-Catalyzed Waterbased Epoxy, 1150 Series, single-component, [eggshell][semi-gloss].
- C. Concrete and CMU Substrates - Epoxy System (wet areas):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat KemCati Kote High Solids Epoxy Filler/Sealer.
 - b. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, gloss
- D. Gypsum Board Wall Substrates – Epoxy:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat ProMar 200 Zero VOC Interior Primer.
 - b. 2 coats Pro Industrial Pre-Catalyzed Waterbased Epoxy, 1150 Series, single-component, eggshell.
- E. Gypsum Board Wall Substrates – Epoxy (wet areas):
 - 1. The Sherwin-Williams Company.

- a. 1 coat ProMar 200 Zero VOC Interior Primer.
 - b. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, eggshell.
- F. Gypsum Board Ceiling Substrates – Epoxy (wet areas):
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Sherwin Williams Macropoxy 646-100.
 - b. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, eggshell.
- G. Existing Tile Substrates and Existing Pre-Painted CMU Substrates:
 - 1. The Sherwin-Williams Company.
 - a. 1 coat Extreme Bond Primer.
 - b. 1 base coat Pro Industrial Pre-Catalyzed Waterbased Epoxy, 1150 Series, single-component, eggshell.
 - c. 2 coats Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, two-component, [eggshell][gloss].

END OF SECTION 099600

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SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Markerboards (101100.A02 - **MB1**).
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for those allowances affecting work of this Section.
 - 2. Section 012300 "Alternates" for those alternates affecting work of this Section.
 - 3. Section 097723 "Fabric-Wrapped Panels" for tackable, fabric-covered panels mounted on walls.

1.2 PREINSTALLATION MEETINGS

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

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.
 - 2. Include electrical characteristics for motorized units.
- B. Shop Drawings: For visual display units.
 - 1. Include plans, elevations, sections, details, and attachment to other work.
 - 2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
 - 3. Show locations and layout of special-purpose graphics.
 - 4. Include sections of typical trim members.
 - 5. Include wiring diagrams for power and control wiring.
 - 6. Show dimensioned layout and elevation of each area, indicate number of panels for each layout.
 - 7. Include illustrations of each type of mounting system.
- C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
 - 1. Samples of facings for each visual display panel type, indicating color and texture.
 - 2. Actual factory-finish color samples, applied to aluminum substrate.
 - 3. Include accessory Samples to verify color selected.
- D. Samples for Verification: For each type of visual display unit indicated.
 - 1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch-long sections of each trim profile.
 - 3. Display Rail: 6-inch-long section of each type.
 - 4. Accessories: Full-size Sample of each type of accessory.
- E. Product Schedule: For visual display units. Use same designations indicated on Drawings.

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. Operation and Maintenance Data: For visual display units[and motorized units] to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display surfaces, including factory-applied trim, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

1.8 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.

1.9 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: Life of the building.

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.

- B. 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 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboards (101100.A02 – **MB1**): Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and porcelain-enamel face sheet. Units shall be **4'-0"** tall, unless otherwise indicated.
 - 1. MDF Core: 7/16 inch thick; with 0.005 inch thick, aluminum foil backing.
 - 2. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.
 - 3. Writing Surface: Low Gloss Porcelain Enamel Steel surface recommended by manufacturer for projections.
 - a. Basis of Design: "LCS3" by Claridge Products.
 - 1) Color: White #100.
 - b. Maintenance: Manufacturer's cleaning recommendations shall allow the use of non-proprietary cleaners and shall include instructions for removal of permanent markers.
 - c. Magnetic Surface: Writing surface shall be magnetic and compatible with standard magnetic document fastening products.
 - 4. Frames: Fabricated from not less than 0.062 inch thick, extruded aluminum; 5/8-inch inch flat style trim with mitered corners; factory applied.
 - a. Color: Satin Anodized Aluminum.
 - 5. Markertray: Manufacturer's standard, continuous:
 - a. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

2.4 MATERIALS

- A. 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. Adhesives shall have a VOC content of 50 g/L or less.
- B. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- C. Extruded Aluminum: ASTM B 221, Alloy 6063.
- D. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- E. Hardboard: ANSI A135.4, tempered.
- F. High-Pressure Plastic Laminate: NEMA LD 3.
- G. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.
- H. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
- I. Particleboard: ANSI A208.1, Grade M-1.
- J. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd.; with surface-burning characteristics indicated.
- K. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- L. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, [burlap weave] ; weighing not less than 13 oz./sq. yd.; with surface-burning characteristics indicated.

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. 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.

2.6 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 roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. 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. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

- A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls. Do NOT adhesively apply visual display boards to wall substrates.

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.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motorized, sliding visual display units.

END OF SECTION 101100

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SECTION 101400 - SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Signage:
 - a. Flat Cut:
 - 1) Standard (101400.A30).
 - 2) Custom (101400.A31).
 - b. Film:
 - 1) Solid color vinyl (101400.A43).
 - c. Direct Print Graphic:
 - 1) Direct Print - Acrylic (101400.A50).
- B. Related Sections include the following:
 - 1. Section 061000 "Rough Carpentry" for signage blocking.
 - 2. Section 101423 "ADA and Code Signage" for related graphic substrate.

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
- B. Final Artwork: High resolution digital files to be used for production (including digital printing).
 - 1. Graphics shown in drawings are placeholders only.
 - 2. Final artwork to be supplied by Designer (or architect), after approval from Owner, to Signage contractor.
 - 3. Signage Contractor to use final art in creating shop drawings for approval by Designer,
- C. Signage Contractor: Contractor responsible for the fabrication and installation of signage unless responsibility for fabrication or installation is called out by others in the drawings.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule including submittals, engineering, fabrication and installation. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for during and after installation.
 - 3. Architect to work with Contractor to arrange the meeting. Architect to set agenda and run the meeting.
- B. Signage Contractor is responsible for obtaining all required signage permits.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Including but not limited to, the following:
 - 1. Manufacturer's technical product data for each type of product specified. Include data on physical characteristics, durability, fade resistance, flame resistance and manufacturing process.
 - 2. Product data shall show compliance with requirements for fire performance characteristics and physical properties.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of signs and supports. Include plans, elevations, and large scale details of sign wording and lettering layout. Include large scale sections of typical members and other components.

1. Show fabrication joints and fasteners. Show anchors, grounds, reinforcement, accessories, layout, and installation details including attachments to other work. Indicate materials and profiles of signage fittings, joinery, finishes, fasteners, anchorages, and accessory items.
 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 3. Based on Message Schedule approved by Owner, provide sign layouts for all signs:
 - a. Indicate message line breaks.
 - b. Include large scale details of signs wording and lettering layout, pictograms (arrows and symbols), artwork, and Braille layout.
 - c. Include outline of sign face, character spacing, line spacing, and copy composition.
 - d. Submit product data simultaneously for overall review and comparison prior to fabrication.
 4. Include a panel map for each vinyl film sign to coordinate installation.
 5. Field Dimensions shall be obtained, reviewed, and accepted by signage manufacturer prior to submittal of shop drawings. Refer to Article **1.4.G**. "Field Dimensions for Environmental Graphics."
 6. For signage required to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 7. Wiring Diagrams: For illuminated signs and illuminated characters. Include locations of transformers and disconnect switches.
 8. For signs supported by or anchored to permanent construction, provide setting drawings, full-size spacing templates, and directions for installation of anchor bolts and other appropriate anchors to be installed.
 9. Submit drawings in 11 inch by 17 inch format unless otherwise requested by the Architect.
 10. Submit all shop drawings as a single package by Signage Contractor.
- C. Sign Schedule: Use same designations indicated on Drawings.
- D. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors and materials available.
- E. for the following:
1. Sign Types:
- F. Samples for Verification:
1. Submit an 8 inch by 10 inch sample of each material showing finishes, colors, surface textures and qualities of manufacturer and design of each component including graphics.
 2. Submit full-size samples of signage. Quantity and type shall be determined by Architect with intent of one sample per each signage type representative of all types of products indicated.
 - a. Sign Types:
 - 1) Wall Mounted System (101400.A82) - Fry Reglet
 3. Custom Digital Graphic Proofs, including vinyl film and direct printing: Before printing final work, prepare full-color proofs which include a 24 inch x 24 inch full-scale sample at full resolution, as well as a reduced sample of the entire graphic for each mural for the Architect's approval. Approved proof will set the quality standards for graphic and aesthetic effect.
 - a. Sample must be printed on specified material.
 - b. Include any overlaminates or coatings that will be used in final application.
 - c. Samples for clear film must be applied to a ¼" sheet of acrylic for review.
 - d. When wall graphic is divided into separate sections, provide proof of each section.
 - e. Submit results of adhesion test for graphic film to Architect and Owner prior to installation.
 - f. Sample from same flitch to be used for the work, with specified finish applied.
 4. Submit 12-inch-long actual samples of each accessory required.
 5. Samples to be kept by the Architect as a record to later match against items in the field.
 6. Wall Mounted System (101400.A82) - Fry Reglet
 - a. For each type of panel and panel system, in manufacturer's standard sizes, but not less than the following:
 - 1) Samples for architectural wall cladding system in aluminum frame, sample shall not be less than 2 feet square. Sample shall illustrate colors and finishes, showing texture range, and consistency of color and finish for each panel type. Sample shall incorporate each type of panel specified and include an outside corner along one edge of sample.
- G. Delegated-Design Submittal: For all signage unless otherwise noted.
1. Signage Contractor is responsible for determining proper mounting, fastening and anchoring methods including the design of concrete bases, concrete footings, and anchorage to signage frame for all signs unless noted otherwise. Determination to account for surface material sign is being mounted upon.

2. Drawings are for aesthetic and functional design intent, only. No instructions for structural appropriateness have been made. It is the responsibility of the signage contractor to ensure that all elements are fabricated for a stable and durable installation while adhering to the aesthetic details indicated.
 3. Professional Engineer Qualifications: A legally qualified professional engineer licensed in the State of Missouri who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for design and installations of signs, flagpoles, and miscellaneous support that is similar to those indicated for this Project in material, design, and extent. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.
- H. Mockups/Field Samples: Build mockups/field samples to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Approved Mock-ups to be kept by Architect as a reference to set the minimum standard of quality for work on site.
1. Build mockups/field samples for environmental graphics and signage and additional signage as requested:
 - a. Sign Types:
 - 1) EGD01: Full scale "S" from "DISTRICT"
 - 2) EGD02: Full scale sign with "2"
 - 3) EGD03: Full sign with attachment hardware.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups/field sample areas may become part of the completed work if undisturbed at the time of Substantial Completion.
 - a. Contractor shall be held responsible for unsuccessful installations of vinyl graphic film that damage substrate during construction.
 - b. Direct Print Graphic to be installed in location deemed acceptable by the Architect/Owner prior to full install.
- I. Field Dimensions for Graphic Design:
1. Provide field dimensions to Architect for graphic design of graphics.
 - a. Field dimensions shall be accepted by Architect prior to final art release.
 2. Include dimensions, locations, and graphic depictions of all disruptions within the field of wall surface indicated to receive graphic signage. Examples of disruptions of wall surface include, but are not limited to, the following:
 - a. Louvers, Vents, Ductwork, Thermostats.
 - b. Outlets, Light Switches, Light Fixtures, and Conduit.
 - c. Wall Base, Baseboards, Corner Guards, Expansion Joints, and Reveal Joints.
 - d. Motion Sensors.
 - e. Fire Alarm Devices.
 - f. Fire Extinguishers and Fire Extinguisher Cabinets.
 - g. Furnitures.
 - h. ADA signage, Room Signage, and other Code required signage.
 - i. Doors and Windows.
 - j. Mullions, Frames, and Handles.
 - k. Televisions.
 - l. Other obstructions to wall or glazing surfaces not listed that would adversely affect wall graphic design.
 3. Elevations and dimensions shall be drawing using a computer aided drafting program and submitted in a legible format.
 4. Dimensional Tolerance: 1/8-inch maximum.
 5. Dimensions shall be reviewed and accepted by signage manufacturer prior to submittal of shop drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Warranty: Provide warranty documentation for signage.

1.7 QUALITY ASSURANCE

- A. Signage Contractor Qualifications: All sign fabrication within this section shall be performed by a signage contractor with the following:
 - 1. A minimum of five (5) years experience producing architectural signs, and a minimum of five (5) years experience producing compliant signs as specified in ANSI 117.1 (1986), Minimum Guidelines and Requirements for Accessible Design (MGRAD), Uniform Federal Accessibility Standards (UFAS) and American with Disabilities Act Accessibility Guidelines (ADAAG).
 - 2. A firm that employs skilled workers experienced in producing custom-fabricated products similar to those required for this Project and with at least seven years continuous experience under the current company name. Fabricator shall have a record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - 3. Fabricator shall have completed at least seven (7) similar signage projects having similar requirements within the last four (4) years for each signage type.
 - 4. 3M-certified printer and 3M-certified installer. Subcontracting to a 3M-certified printer is acceptable.
- B. Uniformity of Manufacturer: For each separate type of sign and graphic image required, obtain signs from a single manufacturer.
 - 1. Manufacturer's name, trade name, or trademark shall not appear on any visible surface.
- C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines. Comply with applicable provisions in ICC/ANSI A117.1.
- D. Fire Performance Characteristics: Provide wall coverings with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify wall coverings with appropriate markings of applicable testing and inspecting organization.
 - 1. Flame Spread: 5 or less.
 - 2. Smoke Developed: 25 or less.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, National Electrical Code, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Aesthetic Requirements: Provide copy with straight and true edges; space characters as indicated; reproduce type style accurately with square corners and even curves; provide uniform letters and symbols; and provide smooth finishes with no visible imperfections.
- G. ADA Accessibility Guidelines: Signage shall comply with the ADA Accessibility Guidelines where applicable. Characters and graphics, including but-not limited to, copy height, letter stroke symbols, materials, and finishes indicated on the Drawings are intended as guidelines for compliance. Implement each applicable ADA guideline. Should conflicts arise, notify the Designer before proceeding.
- H. Inspections: The Architect reserves the right to periodically visit the Signage Contractor's facilities to inspect and review layouts.
- I. Wall Mounted System (101400.A82):
 - 1. Manufacturer for architectural wall cladding system shall have a minimum of five years experience in manufacturing architectural materials. Single source supplied, wall cladding system consisting of factory mitered and welded framing assemblies and specified infill panels.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage to signage. Store materials to permit easy access for inspection and identification.
 - 1. Keep aluminum off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect aluminum and packaged materials from corrosion and deterioration.
- B. Coordinate delivery and storage of sign materials with the Owner. Schedule delivery to minimize storage requirements.

- C. Store signage in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity. Materials stored at the Project Site without prior approval of the Owner, may have to be relocated at the sign Signage Contractor's expense.

1.9 PROJECT CONDITIONS

- A. Weather Limitations for Exterior Signage: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Interior Environmental Limitations: Do not deliver and install glass graphics until spaces are enclosed and weathertight, wet work in spaces to receive murals is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 1. Maintain a constant temperature not less than 60 deg F in installation areas for at least 10 days before and 10 days after installation.
- C. Lighting: Do not install vinyl wall graphics until permanent level of lighting is provided on the surfaces to receive murals.
- D. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the vinyl wall graphics manufacturer for full drying and curing.
- E. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 COORDINATION

- A. Signage Contractor is responsible for preparing a schedule indicating engineering, fabrication, delivery, installation, and final inspection of the work. Submit this schedule to the Architect and Owner for approval and coordination with other work at the Project Site.
- B. Installation:
 - 1. Coordinate installation with the Owner, Construction Manager, and other trades.
 - 2. For signs supported by or anchored to permanent construction, coordinate specific requirements for types and placement of anchorage devices and similar items to be used for attaching signs. Deliver such items to Project Site in time for installation.
 - 3. Signage Contractor is responsible for furnishing setting drawings, installation templates and directions for installing for appropriate blocking, anchorage devices, and electrical conduits.
 - 4. Signage Contractor to coordinate all appropriate blocking needed.
- C. Coordinate location of remote transformers with building construction. Ensure that any transformers are accessible after completion of work.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal and polymer finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. General: Use materials of size and thickness indicated or, if not indicated as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
- B. All materials shall be new stock, free from defects impairing strength, durability, and appearance. No fabrication or installation materials or procedures shall be used that will in any way change the usual quality or in any manner have an adverse effect on existing materials and surfaces.
- C. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Message Schedule on Drawings, and on artwork for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage. All digital prints to be high resolution output.
- D. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- E. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
 - 1. Plate and Sheet: ASTM B 209, Alloy 5005-H32 or Alloy 6061-T6.
 - 2. Material Gauge: Produce Fabricated Aluminum Signs with .090" faces and .063" returns.
 - 3. Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
 - 4. Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide SignComp Extrusions and Systems (877.784.0405) or approved comparable product.
 - 5. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of alloy 6063-T5.
 - a. Mounting: Concealed studs, non-corroding for substrates encountered.
 - 6. Cutting: Computer guided lasers cut letters, logos or shapes.
 - 7. Construction: Cut letter returns from .063" coil (1", 1.5", 2", 3", 4", 5", 6") to size based on the desired letter depth, bent to the contour of the laser cut faces to produce a hollow-backed letter with 90° angle edges. Inside joints are MIG welded with 1"-1.5" intervals. Finish exposed welds and surfaces smooth, flush, and blended to match adjoining surfaces.
 - a. For Exterior Applications: Provide weep holes to drain water at lowest part of exterior signage. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.
 - 8. Performance: Welds are tested for strength. Finishes are Salt Fog tested to ASTM B-117-95 for corrosion resistance.
 - 9. Finishes:
 - a. Painted finish – DA sanded face & returns, primed, then sprayed; refer to "Coatings and Paintings" Paragraph.
 - b. Brushed finish – vertical grain, brushed face, then clear coated with low gloss acrylic polyurethane.
- F. Aluminum Composite Material: Comprised of two pre-painted sheets of aluminum with a solid polyethylene core. Meets Class A fire rating (ASTM E-84).
 - 1. Basis of Design Products:
 - a. "Alucabond" by 3A Composites.
 - 1) Gauge: 0.020" thick aluminum sheet facings.
 - 2) Panel Thickness: 4mm.
- G. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVA (UV absorbing).
- H. Expanded PVC Sheet: Subject to compliance with requirements, provide "Sintra" by 3A Composites.
 - 1. Material: Moderately expanded closed-cell polyvinyl chloride.
 - 2. Color: As selected by Architect from manufacturer's full range.

3. Basis-of-Design Product: Subject to compliance with requirements, provide "Sintra" by 3A Composites or a comparable product of an approved manufacturer.
- I. Structural Steel: Refer to Section 055000 "Metal Fabrications".
- J. 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.

2.2 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: 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.
- D. Acrylic Sheet Finishes
 1. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.
- E. Coatings and Paints: 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.
 1. Baked Enamel:
 - a. Exposed panel finish: Deterioration includes, but is not limited to, the following:
 - 1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - 2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - 3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Clear Anodic Finish:
 - a. Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.
 3. Color Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 4. Fluoropolymer:
 - a. Aluminum:
 - 1) 2-Coat Fluoropolymer: AAMA 621. 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 manufacturer's written instructions.
 - 2) Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3) Mica Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish with suspended mica flakes 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.
 - 4) Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, coating and resin manufacturers' written instructions.
 5. Industrial Paint Finish:
 - a. Basis of Design: Provide acrylic polyurethane "MAP-LVG Ultra Low VOC" by Matthews Paint Company or a comparable product submitted to and accepted by Architect with the following product characteristics.
 - 1) Finish: Satin
 - b. Finished coated surface shall provide a minimum of 150 in/lbs of impact resistance on all exposed faces.
 - c. All edges and faces shall have a seamless finish unless indicated otherwise on drawings.
 6. Overcoat/Topcoat:

- a. Basis of Design Products: Subject to compliance with requirements, provide "Clear Diamond Finish" by KBS or a comparable product with the following criteria proposed to and accepted by Architect prior to bidding.
 - 1) Provide: Three topcoats.
- 7. Powder-Coat:
 - a. 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 backing finish.
- F. Direct Print Graphics
 - 1. Direct Print: Colored pigments for Plywood Sheet: For copy and background colors, provide colored coatings, including inks, that are recommended by manufacturers for optimum adherence to plywood surface and that are UV and water resistant for five years for application indicated on drawings. Coat with a clear topcoat finish as specified in 099300 "Staining and Transparent Finishing" as recommended by manufacturers.
 - 2. Lettering: Finish as indicated on the Architectural Drawings.

2.3 ACCESSORIES

- A. Mounting Methods: Use double sided vinyl tape and silicone adhesive fabricated from materials that are not corrosive to sign materials and mounting surface.
- B. Adjustable Edge Grips: Subject to compliance with requirements, provide "SO-APEG9" by Gyford Display or comparable product with the following product characteristics, submitted to and accepted by Architect prior to bidding:
 - 1. Material: Anodized aluminum.
 - 2. Stud Dimensions: 1 inch diameter by 1-15/16 inch length.
 - 3. Nylon tip set screw.
- C. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
 - 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.
 - b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant, Allen-head slots unless otherwise indicated.
- D. Visible studs shall have sleeves painted to match color specified by Architect.
- E. Tamper Resistant Standoff Supports: Subject to compliance with requirements, provide "WSS-1619/TP" by NovaDisplay or comparable product with the following product characteristics, submitted to and accepted by Architect prior to bidding:
 - 1. Material: SS201 Stainless Steel.
 - 2. Stud Dimensions: 5/8 inch diameter by 3/4 inch length.
 - 3. Panel Requirements:
 - a. Maximum Panel Thickness: 1/2 inch.
 - b. Panel Hole Size: 7/16 inch.
 - 4. Cap Thread Size: M10x1.25.
 - 5. Accessory: Provide nylon or neoprene gasket.
- F. Tamper Resistant Standoff Supports: Subject to compliance with requirements, provide "SOK-8-100" by Gyford or comparable product with the following product characteristics, submitted to and accepted by Architect prior to bidding. Quantities as required to complete design as indicated on the Construction Drawings.
 - 1. Material: Anodized aluminum.
 - 2. Stud Dimensions: 5/8 inch diameter.
 - 3. Components:
 - a. SO-CAP8.
 - b. SO-100.
 - c. HD-S19.
 - d. HD-CBS1.
 - e. HD-FDA1.

4. Accessory: Provide nylon or neoprene gasket.
- G. Stand-off-Hardware: Provide products from CR Laurence Co. as indicated below. Fabricate from Type 316 stainless steel. Finish shall be brushed stainless steel. Provide all accessories necessary for mounting to underside of transaction counter.
1. Stand-Off-Base: Model S0B10112BS by CR Laurence (1-inch diameter by 1-1/2 inch long standoff sleeve).
 2. Stand-Off-Cap: Model CAP1BS by CR Laurence (1-inch diameter standoff cap).
 3. Comparable products from other manufacturers will be considered.
- H. Extrusion Trim: Subject to compliance with requirements, provide "Structurelite SL-C-CHANNEL" by Gyford or comparable product with the following product characteristics, submitted to and accepted by Architect prior to bidding. Quantities as required to complete design as indicated on the Construction Drawings.
1. Material: Anodized aluminum.
 2. Dimensions: As indicated on Drawings.
 3. Components:
 - a. SL-CHNLCAP
 - b. Mounting Kit

2.4 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
 2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
 5. Internally brace signs for stability and for securing fasteners.
 6. Provide rebates, lugs, and brackets 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.
 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing
- 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.

2.5 FLAT CUT

- A. General: Flat Cut
1. Standard (101400.A30 - **EGD 02**).
 2. Custom (101400.A31 - **EGD 01**).
- B. Flat cut characters and shapes with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:
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. APCO Graphics, Inc.
 - b. R. K. Ramos Signage Systems.
 - c. ASI Sign Systems, Inc.
 - d. Dimensional Innovations.
 - e. Gemini Incorporated.
 - f. Metallic Arts.
 - g. Square One.

- C. Refer to Drawings for:
 - 1. Sign Height, Width and Depth.
 - 2. Typeface and Character Spacing.
 - 3. Color.
 - 4. Mounting Position.
- D. Mounting: Furnish inserts and other anchorage devices to connect masonry work. Coordinate anchorage devices with supporting structure.
 - 1. Fabricate anchorage devices that are capable of withstanding dead loads of units.
 - 2. Lettering shall be pin-mounted and stood off wall **1 inch** unless indicated otherwise.
- E. Refer to Article 2.1 "Materials" for material technical information.
- F. Refer to Article 2.2 "Finishes" for materials selected below.
- G. Material selection:
 - 1. ALUMINUM
 - a. Fabricate flat-cut-out characters and shapes from aluminum sheet/plate of thickness as indicated on drawings.
 - b. Welding: Use welding method that is appropriate for metal and finish indicated and that develops full strength of members joined. Finish exposed welds and surfaces smooth, flush, and blended to match adjoining surfaces.
 - c. Finishes:
 - 1) Baked Enamel or Powder-Coat Finish: Manufacturer's standard, in color finish selected by the Architect.

2.6 FILM SIGNAGE

- A. Solid Color Vinyl (101400.A43 - **EGD 02**):
 - 1. Basis of Design Products: Subject to compliance with requirements, provide "IJ680CR" by 3M or a comparable product with the following criteria proposed to and accepted by Architect prior to bidding.
 - a. https://www.3m.com/3M/en_US/p/d/b00020926/
 - b. Material: Vinyl.
 - c. Finish: Luster.
 - d. Color: White.
 - e. Thickness: 7-8 mil.
 - f. Adhesive type: Manufacturer's standard releasable pressure sensitive adhesive.
 - g. Adhesive color: Clear with silver underneath.
 - h. Liner: Polyethylene coated paper.
 - i. Chemical Resistance: Resists mild alkalis, mild acids, and salt. Excellent resistance to water.
 - j. Applied film shrinkage: less than 0.4 mm.
 - k. Weeded Custom Cut in factory as indicated on drawings for field installation.
 - l. Artwork shall be furnished by the Owner, on disc to manufacturer's standards.

2.7 DIRECT PRINT GRAPHIC

- A. Direct Print - Acrylic (101400.A50 - **EGD03**).
- B. General:
 - 1. Refer to Drawings for:
 - a. Sign Height, Width and Depth.
 - b. Typeface and Character Spacing.
 - c. Color.
 - d. Mounting Position.
- C. Refer to Section 2.2 "Finishes" for requirements for Direct Print Graphics.
 - 1. Color: As selected by Architect from full Pantone range including white.

- D. Interior Direct Print Acrylic (101400.A50): Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

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 work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Verify that items provided under other sections of Work are sized and located to accommodate signs.
- E. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.
- G. Field verify dimensions of all conditions.

3.2 INSTALLATION, GENERAL

- A. Preparation
 - 1. Acclimatize materials by removing them from packaging in the installation areas not less than 24 hours before installation.
 - 2. Follow manufacturer's printed instructions for surface preparation.
 - a. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
 - b. Painted surfaces: Treat areas susceptible to pigment bleeding.
 - c. Metals: If not factory-primed, clean and apply rust inhibitive zinc primer.
 - d. Moisture content: maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - e. Adhesion Test: Perform manufacturer's standard non-destructive adhesion test on substrate, prime or repaint all surfaces that fail adhesion test as recommended by manufacturer.
- B. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- C. Wall-Mounted Signs on Textured Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply. Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 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.
- D. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1m).

E. Installation - Fabricated Signage

1. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - a. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - 1) 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.
 - 2) 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.
 - b. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - 1) 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.
 - 2) 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.
 - c. 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.

F. Installation – Film Signage

1. Field-Applied, Vinyl-Film Signs:
 - a. Align sign Characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.
 - b. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
- B. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes to components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- C. Remove temporary protective coverings and strippable films as signs are installed.
- D. 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 conditions during construction and protect from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 101423 - ADA AND CODE SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wayfinding Panel Signage (101423.A01):
 - a. Interior Room signage.
 - b. Custom fabricated polymer plastic signage.
- B. Related Sections include the following:
 - 1. Section 012100 "Allowances" for interior room signage and exterior door signage.
 - 2. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
 - 3. Division 26 Section "Interior Lighting" and "Exterior Lighting" for illuminated signs.

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
- B. Signage Contractor: Contractor responsible for the fabrication and installation of signage unless responsibility for fabrication or installation is called out by others in the drawings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Including but not limited to, the following:
 - 1. Manufacturer's technical product data for each type of product specified. Include data on physical characteristics, durability, fade resistance, flame resistance and manufacturing process.
 - 2. Product data shall show compliance with requirements for fire performance characteristics and physical properties.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
 - 3. Include fabrication and installation details, and attachments to other work.
 - 4. Include elevations, component details, and attachments to other work for wayfinding signage.
 - 5. Indicate materials and profiles of signage fittings, joinery, finishes, fasteners, anchorages, and accessory items.
 - 6. Field Dimensions shall be obtained, reviewed, and accepted by signage manufacturer prior to submittal of shop drawings.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Aluminum.
- D. Samples for Verification:
 - 1. Sample from same flitch to be used for the Work, with specified finish applied.
 - 2. Submit full-size samples of wayfinding signage. Quantity and type shall be determined by Architect with intent of one sample per each signage type representative of all types of products indicated.
- E. Sign Schedule: Use same designations indicated on Drawings.

- F. Mockups/Field Samples: Build mockups/field samples to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Warranty: Special warranty specified in this Section.
- C. Provide written documentation that the braille translation included on the manufacturer's signage provided in this section has been evaluated by the American Foundation for the Blind, and is, in their opinion, correct and compliant with ADAAG.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Fabricator Qualifications: A firm that employs skilled workers experienced in producing custom-fabricated products similar to those required for this Project and with at least seven years continuous experience under the current company name. Fabricator shall have a record of successful in-service performance, as well as sufficient production capacity to produce required units.
 - 1. Fabricator shall have completed at least seven (7) similar signage projects having similar requirements within the last four (4) years for each signage type.
- C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- D. Regulatory Requirements: Comply with applicable provisions in ICC A117.1.
- E. Fire Performance Characteristics: Provide wall coverings with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify wall coverings with appropriate markings of applicable testing and inspecting organization.
 - 1. Flame Spread: 5 or less.
 - 2. Smoke Developed: 25 or less.
- F. Accessibility Guidelines: Signage shall comply with ICC A117.1 where applicable. Characters and graphics, including but-not limited to, copy height, letter stroke symbols, materials, and finishes indicated on the Drawings are intended as guidelines for compliance. Implement each applicable ADA guideline. Should conflicts arise, notify the Designer before proceeding.

1.7 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Required parties include the contractor, sub-contractor and architect/designer.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review temporary protection requirements for during and after installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations for Exterior Signage: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Interior Environmental Limitations: Do not deliver and install vinyl wall graphics until spaces are enclosed and weathertight, wet work in spaces to receive murals is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 1. Maintain a constant temperature not less than 60 deg F in installation areas for at least 10 days before and 10 days after installation.
- C. Lighting: Do not install vinyl wall graphics until permanent level of lighting is provided on the surfaces to receive murals.
- D. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the vinyl wall graphics manufacturer for full drying and curing.
- E. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install ADA and Code Signage units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Use special care in handling to prevent twisting, warping, nicking, and other damage to signage. Store materials to permit easy access for inspection and identification.
- B. Store signage in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.11 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.
- B. For signage 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.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal and polymer finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 MATERIALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
 - 1. Plate and Sheet: ASTM B 209, Alloy 3003-H14, Alloy 5005-H32 or Alloy 6061-T6.
 - 2. Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
 - 3. Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. PETG (Polyethylene Terephthalate Glycol) Sheet: ASTM D 5047-17 category as standard with manufacturer for each sign.
 - 1. Tensile Strength: 7,700 lbf/sq. in. per ASTM D 638.
 - 2. Flexural Modulus of Elasticity: 310,000 lbf/sq. in. per ASTM D 790.
- E. Photopolymer Sheet: Manufacturer's recommended photopolymer for producing integral non-laminated raised copy.
- F. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, ASTM C 1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), coated on both surfaces with abrasion-resistant coating:
 - 1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
 - 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
 - 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
 - 4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
 - 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- G. Expanded PVC Sheet: Subject to compliance with requirements, provide "Sintra" by 3A Composites.
 - 1. Material: Moderately expanded closed-cell polyvinyl chloride.
 - 2. Color: As selected by Architect from manufacturer's full range.
- H. 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.

2.3 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: 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.

D. Aluminum Finishes

1. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

E. Acrylic Sheet Finishes

1. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

2.4 ACCESSORIES

- A. Mounting Methods: Use double sided vinyl tape and silicone adhesive fabricated from materials that are not corrosive to sign materials and mounting surface.

- B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

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.
 - b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant, Allen-head slots unless otherwise indicated.

2.5 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.

1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.
4. Provide rebates, lugs, and brackets 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. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

1. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to product surfaces without distortion, buckles, warp, or other surface deformations.

2.6 WAYFINDING PANEL SIGNAGE – ROOM SIGNAGE (101423.A01)

- A. General: Panel signs shall be acrylic or photopolymer signs with insert window, with an overall thickness of approximately 5/16 inch. Existing signs were constructed as follows:

1. Provide back sheet of 1/8 inch thick acrylic with first surface painted.
2. Provide 1/16 inch spacer for insert window.
3. Provide 1/8 inch thick photopolymer with first surface painted.
4. Provide painted edges for solid appearance.
5. Provide white raised numbers and braille, unless otherwise indicated or required by code.

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

1. Ad Trends.
2. APCO Signs.
3. ASI Sign Systems, Inc.
4. Fast Signs.
5. Gemini.
6. Howard Industries.

7. Innerface Architectural Signage, Inc.
 8. Modulex.
 9. Nova Polymers.
 10. Star Signs.
 11. Take Form.
 12. 2/90 Sign Systems.
- C. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.
 - D. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of slide-in inserts.
 - E. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
 1. Raised-Copy Thickness: Not less than 1/32 inch.
 - F. Subsurface Copy: Apply minimum 4-mil- thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.
 - G. Colored Coatings for Acrylic Sheet: For copy background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
 1. Color: As selected by Architect from manufacturer's full range.
 - H. Sign Types – General: There will be one type with tactile/Braille to match existing interior signage to best extent possible as acceptable to Architect.
 - I. Provide Glass Backing as indicated on ADA and Code Signage Schedule.

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 work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs.
- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Verify that items provided under other sections of Work are sized and located to accommodate signs.
- E. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.
- G. Field verify dimensions of all conditions.

3.2 INSTALLATION, GENERAL

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

- B. Wall-Mounted Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.
- C. Wall-Mounted Signs on Smooth Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces. Where signage is located on exterior surfaces, provide exterior rated adhesive as recommended by signage manufacturer for substrate indicated.
- D. Wall-Mounted Signs on Textured Surfaces: Comply with sign manufacturer's written instructions except where more stringent requirements apply. Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 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.
- E. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1m)

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
- B. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes to components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- C. Remove temporary protective coverings and strippable films as signs are installed.
- D. 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 conditions during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

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SECTION 102113 - TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid-polymer (HDPE) toilet compartments configured as toilet enclosures (102113.A01).
 - 2. Solid-polymer (HDPE) urinal screens (102113.A02).
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for blocking.
 - 2. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

1.2 COORDINATION

- A. Coordinate requirements for blocking, reinforcing, and other supports concealed within walls.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments and urinal screens. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show layout and size of each toilet compartment.
 - 2. Show layout and size for each urinal screen.
 - 3. Show locations of cutouts for compartment-mounted toilet accessories.
 - 4. Show locations of centerlines of toilet fixtures.
 - 5. Show locations of floor drains.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of compartment material involving texture 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, texture, and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has five years of similar installations.
- B. Source Limitations: For products listed in the Part 2 articles, obtain products from single source from single manufacturer.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.7 WARRANTY

- A. Guarantee entire installation for a period of two years from date of project Substantial Completion against defects in material and workmanship. Guarantee covers repair or replacement, with no costs to the Owner, of any and all items which become defective within the 25-year period.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-POLYMER TOILET COMPARTMENTS (102113.A01)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products, Hiney Hiders "Eclipse" toilet enclosure units or comparable product by one of the following:
 - 1. Accurate Partitions Corporation.
 - 2. Bradley Corporation; Mills Partitions.
 - 3. General Partitions Mfg. Corp.
 - 4. Hadrian
 - 5. Partition Systems Incorporated of South Carolina (PSISC).
- B. Toilet-Enclosure Style: Floor-mounted overhead braced.
 - 1. Compartment Depth and Width: As scheduled and indicated on Drawings.
 - 2. Door Width: As scheduled and indicated on the Drawings.
 - 3. Height Above Floor: 9 inches (305 mm).
 - 4. Door/Panel Height: As scheduled and indicated on the Drawings.
 - 5. Pilaster Height: As scheduled and indicated on Drawings.
- C. Urinal-Screen Style: Floor-mounted, overhead braced with continuous wall brackets.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, seamless, with eased edges, "no-sightline system" and with homogenous color and pattern throughout thickness of material.
 - 1. Material Thicknesses:
 - a. Doors, Pilasters, Panels and Screens: 1 inch.
 - 1) Edge condition: Eased edges, except shiplap at latch stile of door to pilaster to eliminate sightline into toilet compartment.
 - b. Panels: Not less than 1 inch.
 - c. Compartments shall incorporate a lap joint at latch stile of doors and adjacent pilaster, and continuous hinges at hinge stile of door and adjacent pilaster to eliminate sightlines into stalls.
 - 2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 - 3. Pilaster shoes shall be 3 inches (76 mm) high, one-piece molded HDPE secured to the pilaster with a stainless-steel tamper resistant Torx head sex bolt.
 - 4. Color and Pattern: One color, pattern and texture in each room.
 - a. Color and Pattern: As selected by Architect from manufacturer's full range.
- E. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum or stainless steel.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 - 1. Material: Clear-anodized aluminum or stainless steel.
 - 2. Hinges: Provide 8-inch, "wrap-around" hinges fabricated from aluminum in a bright anodized finish. Hinges shall have field adjustment capability. Hinge shall be self-closing to within 15 degrees of opening. Mount with through-bolts.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - a. Coordinate design of door and latch to provide "no-sight line" configuration.
 - b. Type 1 Latch and Keeper: Manufacturer's standard stainless-steel surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Intent is to match existing.
 - c. Type 2 Latch: Manufacturer's standard stainless-steel occupancy indicator latch. Latch to be mounted to the pilaster with integrated function as keeper for in-swinging doors. Latch will provide emergency access through an accessible slotted center pin in the external indicator.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with vandal-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743/A 743M.
- E. High density polyethylene (HPDE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Floor-Mounted Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
 - 1. Each pilaster over 3 inches wide shall be anchored to floor with a minimum of two (2) anchors to prevent twisting.
 - 2. Overhead Bracing shall not be installed over open stall areas. At areas where additional overhead support is necessary, consult with architect to provide alternate means of support.

- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for compartments designated as accessible.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Brackets: Secure panels to walls and to pilasters with continuous brackets.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach screens to pilasters and walls with continuous brackets and anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.
- B. Clean exposed surfaces of compartment systems using materials and methods recommended by manufacturer and provide protection as necessary to prevent damage during remainder of construction period.

3.4 FINAL PROTECTION

- A. Provide final protection and maintain conditions the ensure toilet compartments and screens are without damage and deterioration at time of Substantial Completion.
- B. If any damage occurs, replace unit(s), unless repairs acceptable to Architect can be made.
- C. Should damage occur to partition, door or pilaster in shipping, those damaged items shall be replaced within 30 days.

END OF SECTION 102113

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Shock Absorbing Corner Guards (102600.A03).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for description of alternates affecting work of this Section.
 - 2. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.
 - 3. Section 092900 "Gypsum Board" for corner trim included in gypsum board installation.

1.2 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.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for each type of impact-resistant wall-protection unit indicated.
 - 1. Include Samples of accent strips and accessories to verify color selection.
 - 2. Digital Protective Wallcovering – submit a sample of each wall graphic type in the form of small-scale color proofs for each graphic or mural.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Corner Guards: 12 inches long.
 - 2. Custom Printed Wall Graphic on Abuse Resistant Wall coverings: Provide sample of wallcovering containing printed graphic using artwork provided by Architect. Before printing, prepare full-color proofs which include a full-scale sample, as well as a reduced sample of the entire graphic for each wall graphic for the Architect's approval. Approved proof will set quality standards for graphic and aesthetic effect.
 - a. Sample size to be no less than 2'-0" to 4'-0" square or as otherwise indicated.
 - b. Sample area as indicated by Architect during proofs.
 - c. When wall graphic is divided into separate sections, provide separate proof of each section.
 - d. Samples to show color, texture, pattern, and thickness.
 - e. Sample of each product specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.4 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.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 01 40 00 "Quality Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- C. Preinstallation Conference: Conduct conference at Project site.

1.6 MOCKUPS

- A. Mockups/Field Samples: Build mockups/field samples, to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Field Samples: Build field sample/mockup of typical wall areas as shown on Drawings.
 - a. Note: Mockup shall be a field sample of corner guard, baseboard, and adjacent areas in Project. Architect and manufacturer's representative will observe installation of first corner guard installation at Architect's selected location.
- B. Field testing shall be performed on field sample areas according to requirements in "Field Quality Control" Article.
- C. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

PART 2 PRODUCTS

2.1 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.

2.2 STAINLESS STEEL CORNER GUARDS (102600.A03) - **TYPE CG1**

- A. Surface-Mounted, Stainless Steel Corner Guards (102600.A03): ASTM A240, Type 304, 16 gauge with #4 satin finish
- B. Basis-of-Design Product: Provide Acrovyn - "CO-8"-Stainless Steel Corner Guard" or approved product with the following characteristics.

1. Description:
 - a. 2 x 2" x 90 degree surface mounted stainless steel corner guard with 3/16" radius corner.
 - b. Height: Full height from top of wall base to ceiling.
 - c. Height shall be 8 feet, unless indicated otherwise.
2. Mechanical Fasteners: Stainless steel #6 x 1-1/2" countersunk sheet metal screws

2.3 MATERIALS

- A. Fasteners: Nonmagnetic stainless-steel metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- C. Adhesive: As recommended by protection product manufacturer.
- D. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.
- E. Stainless-Steel Sheet: ASTM A 240/A 240M.
- F. PETG (Polyethylene Terephthalate Glycol):
 1. Impact Resistance: Minimum 10 kj.m2 when tested according to ISO 180.
 2. Chemical and Stain Resistance: Tested in accordance with ASTM D543.
 3. Flame-Spread Index: 25 or less.
 4. Smoke-Developed Index: 450 or less.
- G. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.

2.4 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
 1. Provide surfaces free of chips, dents, and other imperfections.

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 work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION AND CLEANING

- A. General: Install impact-resistant wall protection units 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.
 1. Install wall protection units in locations and at mounting heights indicated on Drawings.
 2. Provide mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.

- B. Immediately after completion of installation, clean plastic covers and accessories as recommended by corner guard manufacturer.
- C. Stainless Steel Corner Guards: Install corner guards using countersunk oval head mechanical fasteners and supplement with manufactures recommended adhesive. Corner guard edges to be flush with adjacent wall to allow for no gapping.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

TOILET, BATH, AND LAUNDRY ACCESSORIES

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - a. Toilet Tissue Dispenser (102800.A01).
 - b. Paper Towel Dispenser (102800.A02).
 - c. Waste Receptacle 102800.A03).
 - d. Soap Dispenser (102800.A05).
 - e. Grab Bar (102800.A06).
 - f. Sanitary Napkin Dispenser Unit (SND) (102800.A07).
 - g. Sanitary Napkin Receptor Unit (SNR) (102800.A08).
 - h. Mirror Unit (102800.A10).
 - 2. Accessories:
 - a. Diaper Changing Station (102800.A20).
 - b. Mop and Broom Holder (102800.A23).
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for blocking required behind fixtures and accessories.
 - 2. Section 102113 "Toilet Compartments".
 - 3. Division 26 for electrical requirements for illuminated mirror units and warm air dryers.
- C. Owner will furnish, and contractor install the following accessories:
 - 1. Toilet tissue dispensers.
 - 2. Paper towel dispensers.
 - 3. Soap dispensers.
 - 4. Waste receptacles.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
 - 6. Include electrical characteristics.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 - 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 products using designations indicated.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.
- B. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.5 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.
 - 1. Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 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 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch 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 minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 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.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue Dispenser (102800.A01 - TTD) – Provided by Owner, Installed by Contractor.

- B. Paper Towel Dispenser (102800.A02 - PTD) – Provided by Owner, Installed by Contractor.
- C. Paper Towel Dispenser (102800.A02 - PTD) – Provided by Owner, Installed by Contractor.
 - 1. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; Contura Series B-4262.
 - 2. Mounting: Surface mounted, with concealed fasteners.
 - 3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin).
- D. Waste Receptacles – Fully Recessed (102800.A03 - WR) – Provided by Owner, Installed by Contractor.
 - 1. Basis-of-Design Product: Bradley Model 2271.
 - 2. Description: Fully-recessed combination towel dispenser and waste receptacle. Towel cabinet door shall be equipped with piano hinge and tumbler lock. Waste receptacle shall have an 18 gallon capacity and shall be removable.
 - 3. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 4. Provide each unit with manufacturer's standard vinyl liner.
- E. Soap Dispenser (102800.A05 - SD) – Provided by Owner, Installed by Contractor.
- F. Grab Bars – GB, VGB, FGB (102800.A06):
 - 1. Bobrick:
 - a. B-6806.99; 36" 42" & 18" at Accessible Toilet Stalls.
 - b. B-6806.99; 18" & B-5861.99 at Shower.
 - c. B-6806.99; Series Wall-to-Floor Bar w/ bottom rail at DFs w/out Alcove.
 - d. FGB: B-4998.99 at Accessible Toilet and Shower Stall.
 - 2. Bradley:
 - a. 832-2 Series; 36" 42" & 18" at Accessible Toilet Stalls.
 - b. 832-2 Series; 18" & 16"x30" Horizontal Two-Wall Bar at Shower Stall.
 - c. 832-2 Series; Wall-to-Floor Bar w/ bottom rail at DFs w/out Alcove.
 - d. FGB: 8370-107-2 at Accessible Toilet and Shower Stall.
 - 3. ASI:
 - a. 3800-P Series; Type 01 36" 42" & 18" at Accessible Toilet Stalls.
 - b. 3800-P Series; Type 01 18" & Type 60 at Shower Stall.
 - c. 3800-P Series; Type 75 at Drinking Fountains without Alcove.
 - d. FGB: 3413-P at Accessible Toilet and Shower Stall.
- G. Sanitary Napkin Dispenser Unit (10 28 00.A07 - SND):
 - 1. Basis of Design Products:
 - a. ASI: Model # 0468
 - b. Bobrick: Model #B-47069 25
 - c. Bradley: Model #407-11
 - d. ASI: Model # 0468-2
 - e. Bobrick: Model #B-47064 25
 - f. Bradley: Model #407
 - 2. Fabricate cabinet of stainless steel, not less than 22 ga (.034"), all welded construction. Provide door of seamless stainless steel, minimum 18 ga (.050"), with returned edges and equipped with tumbler lockset. Provide identification reading "Napkins" and "Tampons" at coin slots; brand name advertising is not allowed. Capacity not less than 18 napkins and 28 tampons.
 - 3. Operation: 25-cent coin operation, with locked coin box keyed separately from door and other accessory units.
- H. Sanitary-Napkin Receptor Unit (102800.A08 - SNR):
 - 1. Basis of Design Products:
 - a. Bradley: Model 4721-15 & 4722-15.
 - b. ASI: Model 0473-1A & 0472-1.
 - 2. Mounting: Surface.
 - 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).
- I. Mirror Unit (102800.A10 – M1, M2, M3):
 - 1. Basis-of-Design Products:

- a. Bobrick Washroom Equipment, Inc.; B-290 Series.
 - b. ASI: Model 0600.
- 2. Types:
 - a. M1 – Shall be 18-inches wide x 36-inches height.
- 3. Frame Stainless-steel channel, in No.4 satin finish.
- 4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Concealed wall hanger bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
 - b. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
- 5. Glazing: Provide polished tempered glass mirror in locker rooms and gym facilities. Provide polished non-tempered glass mirror in other locations unless noted otherwise.
- 6. Sizes: As indicated on Drawings.

2.4 CHILDCARE ACCESSORIES

- A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.
- B. Diaper-Changing Station (102800.A20 - DCS):
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide, Koala Kare Products; Model KB300-SS, Color 01 Grey. Comparable products from other manufacturers meeting specified requirements will be considered when submitted to and accepted by Architect prior to bidding.
 - 2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
 - 3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
 - 4. Operation: By pneumatic shock-absorbing mechanism.
 - 5. Material and Finish: HDPE in manufacturer's standard grey color with stainless steel veneer inset in front surface having a No. 4 finish (brushed satin).
 - 6. Unit shall have Microban antimicrobial additive embedded into the bed surface.
 - 7. Unit shall conform to ASTM F 2285-04 "Standard Safety performance Specification for Diaper Changing Tables for Commercial Use".
 - 8. Warranty: Manufacturer's Five years limited warranty.

2.5 CUSTODIAL ACCESSORIES

- A. Mop and Broom Holder with Shelf (102800.A23 - MBH):
 - 1. Description: Unit with shelf, hooks and mop/broom holders.
 - 2. Length: 34 inches.
 - 3. Hooks: Four.
 - 4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 6. Acceptable models from listed manufacturers.

2.6 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 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 recommendations.

END OF SECTION 102800

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SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 1) Provide fire extinguishers for each fire extinguisher cabinet, except where indicated as bracket-mounted.
 - b. Extinguisher Cabinet types:
 - 1) Steel Cabinets
 - (a) 10 44 13.A03 Semi-Recessed Cabinet (rolled edge trim)
 - 2) Steel Cabinets – Fire Rated
 - (a) 10 44 13.A23 Semi-Recessed Cabinet (rolled edge trim)
- B. Related Requirements:
 - 1. Section 104416 "Fire Extinguishers."

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
 - 1. Coordinate sizes and locations of fire protection cabinets with wall depths

1.6 SEQUENCING

- A. Apply vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - 1. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
 - a. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Color: As selected by Architect from manufacturer's full range.
- B. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 FIRE PROTECTION CABINET (104413.A01)

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis of Design Products: Subject to compliance with requirements provide Larsen's Manufacturing Company; Architectural Series products from:
 - a. Larsen's Manufacturing Company; Architectural Series.
 - b. Amerex.
 - c. J. L. Industries, Inc., a division of Activar Construction Products Group.
 - d. Potter Roemer LLC.
 - e. Comparable products from other manufacturers may be used when submitted to and accepted by Architect prior to bidding.
 - 2. 104413.A03 - Steel Cabinet, Non-rated, Semi-recessed. 2-1/2" Rolled.
 - a. Type 03: Semi-recessed Non-rated Cabinets: Larsen's Manufacturing Company; Architectural Series, Model 2409-6R.
 - 3. 104413.A23 - Steel Cabinet, Fire-rated, Semi-recessed. 2-1/2" Rolled.
 - a. Type 23: Semi-recessed Mounted Fire-rated Cabinets: Larsen's Manufacturing Company; Architectural "Flame-Shield" Series, Model FS-2409-6R.
- B. Cabinet Construction:
 - 1. Nonrated.
 - 2. 2-hour fire rated.
 - a. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.
 - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Steel
- G. Door Style: Horizontal duo panel with frame.
- H. Door Glazing: Acrylic sheet.
 - 1. Acrylic Sheet Color: Transparent acrylic sheet.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

- 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. 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: Pressure-sensitive vinyl letters.
 - 3) Lettering Color:
 - (a) Red.
 - 4) Orientation: Vertical.
- K. Cabinet Finish:
1. Manufacturer's standard baked-enamel paint for the following.
 2. Color: White as primer base. Cabinets to be painted in field
 3. Interior of cabinet to match exterior.
 4. Door and Trim: Match fire extinguisher door face finish.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
1. Fabricate door frames of one-piece construction with edges flanged.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 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 of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. 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.

2.5 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" . After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Baked-Enamel or Powder-Coat Finish: Interior box finish, immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semi-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.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
 - 2. Fire-Rated, Cabinets:
 - a. Install cabinet with not more than 1/16 inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
 - b. Seal through penetrations with firestopping sealant as specified in Division 07 Section "Penetration Firestopping."
- C. Identification: Apply vinyl lettering at locations indicated.

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. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- C. 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.
- D. 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 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

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.

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. Amerex Corporation.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Potter Roemer LLC.
 - e. Comparable products from other manufacturers may be used when submitted to and accepted by Architect prior to bidding.
 - 2. 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 (104416.A01): UL-rated 3-A:40-B:C, 5 lbs. nominal capacity, with mono-ammonium phosphate-based dry chemical in manufacturer's standard enameled container.
- C. Multipurpose Dry-Chemical Type (104416.A01): UL-rated 4-A:80-B:C, 10 lbs. nominal capacity, with mono-ammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 48 inches above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Horizontal louver blinds with aluminum slats.
- B. Related Sections include the following:
 - 1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, special feature descriptions and operating instructions.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds, including: elevations, sections, details and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work/adjacent construction and operational clearances.
- C. Samples for Initial Selection: For each type and color of horizontal louver blind indicated.
 - 1. Include similar Samples of accessories involving color selection.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include precautions for cleaning materials and methods that may be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.
- B. Store materials off ground in dry enclosed space and under cover.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty 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 horizontal louver blinds 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 operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

- A. Submit written guarantee for louver blinds covering workmanship and materials, signed jointly by manufacturer and installer.
 - 1. Louver blind shall have a Life Time warranty.

PART 2 PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS (122113.A01)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Levolor; Custom Mark 1 Metal Blinds, or a comparable product by one of the following:
 - 1. Hunter Douglas.
 - 2. Other manufacturers meeting specified requirements.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
 - 1. Width: 1 inch.
 - a. Spacing: 21 mm.
 - 2. Thickness: Not less than 0.008 inch.
 - 3. Finish: One color, as selected by Architect from manufacturer's full color offering of standard and custom colors.
 - a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
- C. Headrail: Head rail shall be 1 inch high by 1-1/2 inch wide by 0.025 inches thick u shaped, formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and end plugs and the following:
 - 1. Capacity: One blind per headrail.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube, with plastic or metal capped ends top contoured to match crowned shape of slat; with enclosed ladders and tapes to prevent contact with sill.
- E. Ladders: Evenly spaced to prevent long-term slat sag.
 - 1. For Blinds with Nominal Slat Width 1 Inch or Less: Braided string.
 - 2. Ladders shall be dyed to match slat color or be a complimentary color acceptable to Architect.
- F. Lift Cords: Manufacturer's standard.
- G. Tilt Control: Enclosed worm-gear mechanism, slip clutch or detachable wand preventing over-rotation, and linkage rod, and the following:
 - 1. Tilt Operation: Manual with clear plastic wand.
 - 2. Length of Tilt Control: Manufacturer's standard.
 - 3. Tilt: Full.
- H. Lift Operation: Manual, with low-friction cord locking mechanism. Mechanism shall be "crash-proof" type and shall lock automatically upon release of cord.
 - 1. Provide blinds with cord control so that blinds can have variable positions.
 - 2. Provide blinds with "ring pulls" in lieu of tassels. Provide with cord of adequate length so that bottom of ring pull is 5'-4" above finished floor. Where headrail is below 6'-0" above finished floor, provide 4" cord length.
- I. Tilt-Control and Cord-Lock Position: Right and left side of headrail, respectively, unless otherwise indicated.
- J. Valance: Manufacturer's standard.
 - 1. Finish Color Characteristics: Match color, texture, pattern, and gloss of slats.

- K. Mounting: Wall mounting between jambs, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
 - 1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind. Mounting brackets and accessories shall be colored to match headrail/valance.
 - 2. Provide receiver clip on bottom of blinds to secure bottom of blind to sill substrate.
- L. Colors, Textures, Patterns, and Gloss: As selected by Architect from manufacturer's full range.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

- A. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
 - 2. Blind Units Installed outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.
- D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- E. Color-Coated Finish:
 - 1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, 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, operational clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not closer than 2 inches to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.
- B. Jamb Mounted: Install headrail recessed into opening to within 1/2 inch of window frame and flush to head of opening.

3.3 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.
- B. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- D. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122113

SECTION 123200 - MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-faced wood cabinets of stock design.
 - 2. Base Cabinet (123200.A01).
 - 3. Sink Base (123200.A10).
 - 4. Wall Cabinet (123200.A31).
 - 5. Filler (123200.A81).
 - 6. Finished End (123200.A82).
 - 7. End Panel (123200.A83).
 - 8. Apron (123200.A84).
 - 9. Cabinet Locks (123200.A91).
- B. Related Sections:
 - 1. Section 012300 "Alternates" for those alternates effecting work of this Section.
 - 2. Section 061000 "Rough Carpentry" for wood blocking for anchoring manufactured wood casework.
 - 3. Section 064023 "Interior Architectural Woodwork" for custom plastic-laminate-clad casework, countertop brackets.
 - 4. Section 092116 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
 - 5. Section 096513 "Resilient Base and Accessories" for resilient base applied to manufactured wood casework.
 - 6. Section 123666 "Solid Surfacing Countertops".

1.2 DEFINITIONS

- A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.
- B. Balanced Construction: Where exposed face of a panel is surfaced with high pressure plastic laminate and the opposite (back) surface shall receive a balanced product equal in thickness to the face of the panel.
 - 1. Note: Color for interior is not required to match color and pattern of exterior face laminate.
- C. Casework: Modular casework of this Section is that which is pre-manufactured to standard dimensions or sizes. Casework fabricated as part of Section 064023 "Interior Architectural Woodwork" is that which is custom fabricated to suit a particular project.
- D. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.
- E. MDF: Medium-density fiberboard.
- F. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.
- G. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets and behind glass doors.
 - 1. Ends of cabinets installed directly against walls or other cabinets shall not be considered as exposed.
- H. Semi-exposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semi-exposed.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, submit data describing materials, fabrication, hardware accessories, and installation instructions.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate types, sizes and finishes of cabinets and countertops.
 - 2. Indicate types and locations of hardware.
 - 3. Indicate locations and types of service fittings.
 - 4. Show fabrication details; including locations and sizes for cutouts and holes for plumbing fixtures, science equipment and other items installed in casework.
 - 5. Indicate locations of blocking and reinforcements required for installing casework.
 - 6. Include details of utility spaces showing supports for conduits and piping.
 - 7. Show installation details, including field joints and filler panels.
 - 8. Indicate locations of and clearances from adjacent walls, doors, windows, and other building components.
 - 9. As applicable, indicate manufacturer's catalog numbers for casework.
- C. Samples for Initial Selection: For cabinet finishes and for each type of top material indicated.
- D. Samples for Verification: 8-by-10-inch Samples for each type of finish, including top material.
 - 1. Exposed hardware, one unit for each type.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer. Furnish qualification data for Installer, if different from manufacturer.
- B. Keying Schedule: Include schematic keying diagram and index each key set to unique designations that are coordinated with the Contract Documents.
- C. Certifications: Submit documentation verifying use of "No added formaldehyde" and "marine grade plywood" were incorporated into the work of this Section, as acceptable to and when requested by Architect.
- D. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer with not less than seven years of successful experience, under the current company name, in producing manufactured casework similar to that required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Installer must have completed projects of similar size and scope to this project in the last 5 years.
- E. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.
- F. Quality Standard: Unless otherwise indicated, comply with the AWI's and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
 - 1. Grade: Custom.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- G. Product Designations: Drawings indicate sizes, configurations, and finish material of manufactured wood casework. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish

material, and complying with the Specifications may be considered as noted below. Refer to Section 012500 "Substitution Procedures" and Section 016000 "Product Requirements."

1. Other manufacturers proposing comparable products shall submit the following for Architect's verification:
 - a. One full-size finished base cabinet complete with hardware, doors, and drawers.
 - b. One full-size finished wall cabinet complete with hardware, doors, and adjustable shelves.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver manufactured wood casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install manufactured wood casework 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 manufactured wood casework by field measurements before fabrication.
 1. Casework manufacturer is responsible for details and dimensions not controlled by job conditions. Show all required field measurements beyond manufacturer's control on shop drawings.
 2. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of manufactured wood casework.
- B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.
- C. Coordinate layout and installation of work of this Section with electrical and plumbing contractors. Coordinate installation so as not to interfere with plumbing and electrical work associated with casework.
- D. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured wood casework that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - d. Deterioration of finishes.
 2. Warranty Period: Three years from date of Substantial Completion.

PART 2- PRODUCTS

2.1 PLASTIC LAMINATE FACED CASEWORK MANUFACTURERS

- A. Manufacturers for Plastic-Laminate-Faced Manufactured Casework: Subject to compliance with requirements, provide products by one of the following:
1. Basis-of-Design Product: Casework as manufactured by Stevens Industries; Stevens Advantage.
 2. Other Manufacturers: Manufacturers list below are required to meet requirements set forth in this Section. Manufacturing procedures may need to be modified for compliance and technical data on casework construction must be submitted for verification. Other manufactures include, but are not limited to:
 - a. TMI Systems Design Corporation.
 - b. Case Systems.
 - c. LSI
 - d. Precision Craft.

2.2 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Drawings indicate sizes, configurations, and finish material of manufactured wood casework from Stevens Industries. Models selected include, but are not limited to, the following:
1. Base Cabinet (123200.A01): Provide casework
 - a. #10129 – 2 Door Base.
 - b. #10430 – Drawer, 2 Door Base Cab. – Base.
 2. Sink Base (123200.A10).
 - a. #10479 – False Front, 2 Door Base Cab. – Base.
 3. Wall Cabinet (123200.A31).
 - a. #15129– 2 Door Wall Cab. – Adjustable Shelves
 - b. #15186– 2 Door Wall Cab.in Upper Compartment with Adjustable Shelves . Lower Open Compartment.
 4. Filler (123200.A81).
 - a. #10803.
 - b. #10805.
 - c. #15803.
 5. Finished End (123200.A82).
 6. Cabinet Locks (123200.A91).
 - a. Drawer and Hinged Door Locks: Provide cam-type locks by COMPM Timberline.
 - b. Provide a minimum of two keys per lock and six master keys.
 - c. Provide locks on all doors and drawers.
 - d. Inactive door shall receive barrel bolt and strike plate.
- B. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

2.3 MATERIALS, GENERAL

- A. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.
- B. Composite Wood Products: Products 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.
- C. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- D. Softwood Plywood: DOC PS 1, with no added formaldehyde (NAUF).
- E. Particleboard: ANSI A208.1, Grade M-2, with no added formaldehyde (NAUF).
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

- F. MDF: ANSI A208.2, Grade 130, with no added formaldehyde (NAUF).
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- G. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
 - 1. Colors: Refer to Material Finish Legend on drawings for basis of design products.
- H. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- I. Edge Banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors, drawer fronts and laminate countertops, 1 mm thick elsewhere.
 - 1. 3mm edge banding shall be machine-applied and set with hot-melt glue.
 - 2. Edge banding colors shall match a solid color of adjacent laminate surface, unless noted otherwise, as determined by Architect. Colors shall not be limited to casework manufacturer's standard stocked colors, but will be selected by Architect from any color group offered by Canplast, Rehau and Doellken-Woodtape.
- J. Edgebanding for Thermoset Decorative Panels: Unless otherwise specified, provide PVC or polyester edge banding complying with LMA EDG-1 and matching thermoset decorative panels.
- K. Adhesives: Use adhesives that 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."

2.4 CABINET MATERIALS

- A. Exposed Cabinet Materials:
 - 1. Plastic Laminate: Grade HGS for horizontal surfaces and VGS for vertical surfaces.
 - 2. Unless otherwise indicated, provide specified edge banding on all exposed edges.
- B. Semiexposed Cabinet Materials:
 - 1. Plastic Laminate: Grade VGS.
 - a. Provide plastic laminate for semi-exposed surfaces unless otherwise indicated.
 - 1) Color for backs of doors and drawers shall match a solid color of that of cabinet box interior, as determined by Architect. Facings shall be balanced as required by AWI construction guidelines for grade level indicated.
 - 2. Unless otherwise indicated, provide specified edge banding on all semi-exposed edges.
- C. Concealed Cabinet Materials:
 - 1. Thermoset decorative panels.

2.5 DESIGN, COLOR, AND FINISH

- A. Design: Provide manufactured wood casework of the following design:
 - 1. Flush overlay.
- B. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected by Architect from casework manufacturer's full range.
- C. Plastic-Laminate Colors, Patterns, and Finishes: As indicated by manufacturer's designations on Drawings.
- D. PVC Edgebanding Color: As selected from casework manufacturer's full range, including pre-formulated colors.
- E. Solid Surfacing: As noted on drawings. Where not specifically indicated, as selected by Architect from manufacturer's full range.

2.6 CABINET FABRICATION

- A. Plastic-Laminate-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:
1. Assembly method for cabinets shall utilize "European" assembly screws (threaded steel dowel pins), similar to Hafele "Conformat". At manufacturer's option, alternate doweled assembly methods may be used if in accordance with AWI guidelines and requirements for grade level indicated.
 2. Cabinets boxes below sinks shall be fabricated from plywood and shall receive white plastic laminate on the interior.
 3. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi-exposed surfaces.
 4. Shelves: Thermoset decorative panels; 3/4-inch thick for spans up to 32 inches and 1-inch thick for spans up to 48 inches.
 5. Open Shelves: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces for spans up to 32 inches and 1-inch thick for spans up to 48 inches.
 6. Backs of Cabinets: 1/2-inch particleboard or 1/4-inch MDF, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi-exposed surfaces. Backs shall be captured in a 1/2-inch dado and set back 3/4-inch to accommodate 3/4-inch thick nailers.
 7. Drawer Fronts: 3/4-inch particleboard, plastic-laminate faced exposed face and balanced backer.
 8. Drawer Sub-fronts, Sides and Backs:
 - a. 1/2-inch single-species solid-wood or veneer-core hardwood (Birch) plywood, with glued dovetail or multiple dowel joints.
 - b. 1/2-inch, high density fiberboard, 55 pcf density minimum. All parts glued and mechanically fastened using thermosetting fasteners.
 - c. 1/2-inch, high density melamine composite panels. All parts glued and mechanically fastened using thermosetting fasteners.
 - d. Fabricate file drawers and lateral file drawers of width and depth necessary to accommodate hanging file rack system.
 9. Drawer Bottoms: 1/4-inch thermoset decorative panels glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
 10. Doors: 3/4-inch particleboard or MDF, plastic-laminate faced.
 11. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.
 12. Cabinets Bases: Bases shall be fabricated separate from cabinets (not integral). Fabricate from 3/4-inch exterior marine grade plywood or preservative-treated 2x4's with marine-grade plywood face. Fabricate in a ladder configuration with plywood fronts and back running continuous for the length of the cabinet. Provide ends, and provide additional runners centered in all cabinets greater than 24 inches wide.
- B. Filler Strips: Provide as needed to close spaces between cabinets and walls, between cabinets and floors, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.
1. Provide top and bottom fillers and corner panels to close gaps and openings.

2.7 CASEWORK HARDWARE AND ACCESSORIES

- A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
 2. Provide caps on fasteners at cabinet interiors in color to match adjacent cabinet finish color.
- B. Butt Hinges: Chrome-plated, semiconcealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide 2 hinges for doors less than 48 inches high and 3 hinges for doors more than 48 inches high.
- C. Pulls:
1. Solid aluminum or chrome-plated wire pulls, fastened from back with two screws. Provide 2 pulls for drawers more than 24 inches wide.
 - a. Basis of Design: Provide Stevens Advantage Bentwire Collection, "Bentwire 128" grey chrome handle - #SA001GC.

- D. Door Catches: Zinc-plated, dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches high.
- E. Drawer Slides: BHMA A156.9, Type B05091.
 - 1. Heavy Duty (Grade 1HD-100): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides. Provide with manufacturer's standard metal rear brackets as applicable.
 - a. Basis-of-Design: GSlide Corporation/Knape & Vogt Mfg. Co.; #GS4200.
- F. Hanging File Rails: Manufacturer's standard hanging file rail system. Provide integral system at all base cabinet drawers with dimensions that will accommodate hanging files.
 - 1. At 36" wide base file cabinets, provide rails on front and back for standard legal side filing. Provide two (2) removable crossbars per drawer for optional letter/legal front-to-back filing.
- G. Adjustable Shelf Supports: 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of manufactured wood casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. General: Install cabinets to comply with same grade as item to be installed.
- B. Install level, plumb, and true; shim as required, using concealed shims. Where manufactured wood casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
 - 1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, or framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.
 - 1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.
 - 2. Use toggle bolts at hollow masonry.
 - 3. Use expansion anchors at solid masonry.
 - 4. Use No. 10 wafer-head screws sized for 1-inch penetration at wood hanging strips.
 - 5. Use No. 10 wafer-head screws sized for 1-inch penetration into wood blocking.
 - 6. Use No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish at metal-framed partitions.
- E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF SHELVING

- A. Securely fasten shelf standards to masonry, partition framing, wood blocking, or reinforcements in partitions.
 - 1. Fasten shelf standards at ends and not more than 12 inches () o.c.
 - 2. Use toggle bolts at hollow masonry.
 - 3. Use expansion anchors at solid masonry.
 - 4. Use self-tapping sheet metal screws in metal framing or metal backing at metal-framed partitions. Do not use wall anchors in gypsum board.
 - 5. Use wood screws sized for 1-inch () penetration into wood blocking.
 - 6. Use toggle bolts at plaster on metal lath.
- B. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Space standards not more than 36 inches o.c.
- C. Install shelving level and straight, closely fitted to other work where indicated.

3.4 CLEANING AND PROTECTING

- 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 plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123200

SECTION 123666 - SOLID SURFACING COUNTERTOPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops (123666.A01).
 - 2. Solid surface material transaction counters (123666.A02).
 - 3. Solid surface material sills (123666.A05).
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for those alternates related to work of this Section.
 - 2. Section 061000 "Rough Carpentry" for blocking as required.
 - 3. Section 079200 "Joint Sealants" for countertop sealants.
 - 4. Section 123200 "Manufactured Wood Casework" for premanufactured casework.
 - 5. Division 22 "Plumbing" for sinks and plumbing fittings.

1.2 DESCRIPTIONS OF WORKS

- A. The solid surfacing subcontractor shall furnish, deliver, set in place, and make ready to use all solid surfacing and related items/materials as herein specified in the rooms scheduled.
- B. Related Work: Except as noted, mechanical, plumbing or electrical contractors will provide all pipe, conduit, ductwork, sinks (except where scheduled), faucets, traps, strainers, supplies, stops, air/gas valves, fittings, switches, lights, electrical receptacles, wire, rough-in and final connection.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, submit data describing materials, fabrication, hardware accessories, and installation instructions.
- B. Shop Drawings: Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures, as applicable.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 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.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop with not less than seven years of experience, under the current company name, that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products or manufacturer's authorized representative who is trained and approved for installation of units required for this Project. Installer must have completed 7 projects of similar size and scope to this project in the last 5 years.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop and sill 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.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect solid surfacing during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver solid surfacing, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate solid surfacing which have been completed in installation areas

1.8 FIELD CONDITIONS

- A. Field Measurements: Where work of this Section is 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. Verify dimensions by field measurements before fabrication is complete.
 - 1. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Solid surfacing subcontractor shall coordinate with the mechanical & electrical contractors to assure proper working clearances, receptacle/fixture locations, and all connection/fittings necessary to function properly.
- B. Coordinate locations of utilities that will penetrate countertops[,transaction counters] or backsplashes.
- C. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of work of this Section.

PART 2 PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS (12 36 66.A01)

- A. Countertops (12 36 66.A01) - **TYPE SS2**: Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Type: Provide Standard type unless Special Purpose type is indicated.
 - 2. Colors and Patterns: As indicated by manufacturer's designations on Material Finish Legend.
 - 3. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart Solid Surface Type 051 or comparable product from an available manufacturer submitted to and accepted by Architect prior to bidding.
 - 4.

- B. Transaction counters (123666.A02) - **TYPE SS2:** 1/2-inch- thick, solid surface material adhesively joined with inconspicuous seams. Edge details as indicated on drawings.
 - 1. Colors and Patterns: As indicated by manufacturer's designations on Material Finish Legend.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart Solid Surface Type 051 or comparable product from an available manufacturer submitted to and accepted by Architect prior to bidding.
 - 3.
- C. Window Sills (123666.A05) - **TYPE SS1:** 1/2-inch- thick, solid surface material adhesively joined with inconspicuous seams. Edge details as indicated on drawings.
 - 1. Colors and Patterns: As indicated by manufacturer's designations on Material Finish Legend.
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart Solid Surface Type 051 or comparable product from an available manufacturer submitted to and accepted by Architect prior to bidding.
- D. Particleboard: ANSI A208.1, Grade M-2, except at countertops with sinks, provide Grade M-2-Exterior Glue.
- E. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP AND SILL 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. Configuration:
 - 1. Front: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash, as applicable.
 - 4. Sills: Straight, slightly eased at top.
- C. Countertops: 1/2-inch- thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch- thick, solid surface material.
- E. Fabricate in one piece, unless otherwise indicated. Comply with solid surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
- F. 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.
 - 2. Install integral sink bowls in countertops in the shop. Ease edge or chamfer edge at sink to countertop connection.
- G. Joints: Fabricate countertops (up to 10 feet in length) without joints.
- H. Joints: Fabricate countertops (greater than 10 feet in length) in sections for joining in field.
 - 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
 - 2. Splined Joints: Where narrow strips of solid surface material between joints occur to form large openings, provide splined joints. Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit.
- I. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop, to best extent possible, 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.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."
- C. Fasteners: Provide non-corrosive fasteners as required for complete installation of components and assemblies. Type and size shall be as required for conditions, materials and superimposed loads involved.
- D. Accessories: Comply with manufacturer's recommendations for hardware, non-corrosive fasteners, adhesives, sealers, fabrication and finishing.

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 subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. 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.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 1. Install metal splines in kerfs in countertop edges at joints as specified. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- E. 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.
- F. 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.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 1. Seal edges of cutouts in particleboard and plywood subtops by saturating with varnish.

H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123666

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