

**LASELLS STEWART CENTER MECHANICAL & ROOF
RENEWAL**

EXHIBIT G.1 – SPECIFICATIONS VOLUME 1



Oregon State
University

**Construction Contracts Administration
Oregon State University
644 SW 13th Ave.
Corvallis, Oregon 97333**



PROJECT MANUAL FOR:
LaSells Stewart Center Mech and Roof Renewal
OREGON STATE UNIVERSITY (OSU)
PERMIT SET

BA PROJECT No. 2108
OSU PROJECT No. 2240-21
VOLUME 1 - DIVISIONS 00 - 11
21 FEBRUARY 2022

DOCUMENT 000107.01

SEALS PAGE

1.01 DESIGN PROFESSIONALS OF RECORD

ARCHITECT

I hereby certify that the following Project Specification Sections were prepared by me or under my direct supervision and that I am a duly registered Architect under the laws of the State of Oregon.

Responsible for Division 01 sections marked with an asterisk (*) in the Table of Contents; and Divisions 02-11 Sections except where indicated as prepared by other design professionals of record.

Joe Echeverri
Bassetti Architects

This document has been digitally signed



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END OF DOCUMENT 000107.01

DOCUMENT 000107.02

SEALS PAGE

1.01 DESIGN PROFESSIONALS OF RECORD

STRUCTURAL ENGINEER

I hereby certify that the following Project Specification Sections were prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Oregon.

Responsible for Sections:

- 051200 – STRUCTURAL STEEL FRAMING
- 054000 – COLD-FORMED METAL FRAMING
- 055000 – METAL FABRICATIONS
- 055213 – PIPE AND TUBE RAILINGS



Mark Tobin, PE, SE
KPF Consulting Engineers

END OF DOCUMENT 000107.02

DOCUMENT 000107.05

SEALS PAGE

1.01 DESIGN PROFESSIONALS OF RECORD

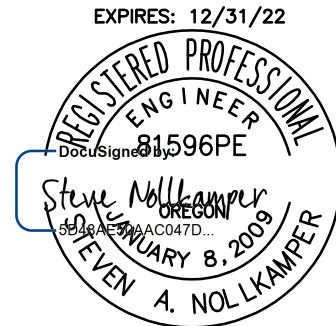
MECHANICAL ENGINEER

I hereby certify that the following Project Specification Sections were prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of **Oregon**.

Responsible for Sections:

- 230500 Basic HVAC Materials and Methods
- 230548 Vibration Isolation for Piping Ductwork and Equipment
- 230549 Seismic Restraint for Piping Ductwork and Equipment
- 230593 Testing Adjusting and Balancing
- 230713 Duct Insulation
- 230719 HVAC Piping Insulation
- 230902 Variable Frequency Drives
- 232300 Refrigerant Piping Systems
- 233113 Air Distribution
- 234100 Air Filtration
- 237312 Custom Factory Air Handling Units
- 237413 Packaged HVAC Units Up to 25 Tons
- 237434 Large Packaged HVAC Units
- 238229 Electric Unit Heaters

Steve Nollkamper, PE
Glumac



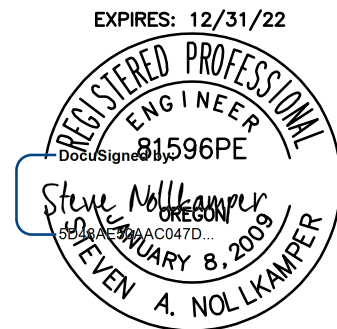
PLUMBING ENGINEER

I hereby certify that the following Project Specification Sections were prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of **Oregon**.

Responsible for Sections:

- 220500 Basic Plumbing Materials and Methods
- 220549 Seismic Restraint for Plumbing Piping and Equipment
- 220700 Plumbing Insulation
- 221000 Plumbing Piping Valves and Specialties
- 224000 Plumbing Fixtures

Steve Nollkamper, PE
Glumac



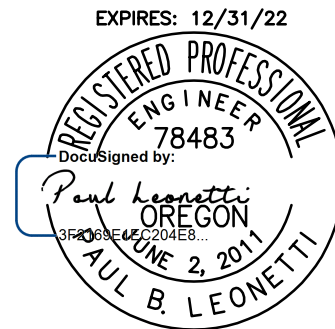
ELECTRICAL ENGINEER

I hereby certify that the following Project Specification Sections were prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of **Oregon**.

Responsible for Sections:

- 260500 Basic Electrical Requirements
- 260519 Low-Voltage Electrical Power Conductors and Cables
- 260526 Grounding and Bonding for Electrical Systems
- 260529 Hangers and Supports
- 260533 Raceways and Boxes for Electrical Systems
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- 265119 LED Interior Lighting
- 265619 LED Exterior Lighting

Paul Leonetti, PE
Glumac



END OF DOCUMENT 000107.05

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Others are sourced from the Owner.

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. The Work Contract consists of the following, at the LaSells Stewart Center on the Oregon State University Campus, 875 SW 26th St., Corvallis, Oregon 97331:
- Installation of fall restraint systems on the existing building.
 - Installation of electrical conduit path from existing electrical panel to roof for future solar equipment.
 - Removal and replacement of existing roof finish and insulation system with new.
 - Removal and replacement of existing skylight and select exterior windows with new.
 - Removal and replacement of select rooftop HVAC equipment with associated equipment curbs and duct connections.
 - Modifications to existing masonry parapets and associated masonry cleaning of the façade.
 - Select exterior lighting fixture removal and reinstallation of existing fixtures.
 - Select exterior light fixture installation of new energy efficient lighting.
 - Removal and replacement of existing mechanical screen enclosures with new.
 - Removal and replacement of existing select mechanical units in concealed ceiling spaces.
 - Removal and replacement of existing ceiling system in selected areas.
- B. Offsite Work can be started within ten (10) calendar days after signing of the Contract on behalf of Oregon State University. On site Work may begin on or after June 13, 2022 and only after the signing of the Contract on behalf of Oregon State University. The Contract may not be signed prior to approval of the Contractor's Certificate of Insurance by Construction Contract Administration (CCA), Oregon State University. Work associated with the exterior scope shall be completed on or before September 30, 2022 and Work associated with the interior scope shall be completed no later than October 14, 2022. In addition, Work shall not occur on the following dates due to events scheduled in the building: June 10-12, 2022, July 4, 2022, July 24-29, 2022, the morning of August 12, 2022, the morning of August 13, 2022 and October 19-21, 2022. Other site restrictions include an event on October 15, 2022 that may be held outside, but access to interior restrooms will be required.

1.02 CONTRACTORS USE OF PREMISES

- A. Contractor shall limit use of the Premises for work and storage to allow for:
1. Owner occupancy, day and night.
 2. Public use, day and night.
 3. Security.
 4. Safe entry and exit for vehicles and pedestrians.
 5. Fire egress.
- B. Coordinate all operations with the Owner's Authorized Representative during the

construction period. A 96-hour notification is required prior to scheduled utility shutdowns or street closures, but more lead time is often required to schedule around other critical activities.

- C. Limit Contractor's employee parking to locations designated at the Pre-construction Conference.

1.03 OWNER OCCUPANCY

- A. The Owner will occupy the Premises during the entire period of construction for the conduct of normal operations. Cooperate with Owner's Authorized Representative in construction operations to minimize conflict and to facilitate the Owner's usage especially in the following areas:
 - 1. Restricted access and parking.
 - 2. Use of stairs.
 - 3. Storage space availability.
 - 4. Auditorium and Backstage
 - 5. Lecture Hall and Conference Rooms.
- B. Conduct operations in such a way to ensure the least inconvenience to the general public, including:
 - 1. Limitations and easements.
 - 2. Emergency vehicle access.
 - 3. Building access to the public, day and night.

1.04 ASBESTOS AND OTHER HAZARDOUS MATERIAL

- A. The Owner has made a reasonable attempt to locate and identify asbestos or other hazardous material that may be encountered during the course of the Work.
- B. If the Contractor observes or suspects the existence of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials in the structure or components of the building, the Contractor shall immediately stop work and notify the Owner's Authorized Representative.
- C. The Owner will arrange for the removal of asbestos, polychlorinated biphenyl (PCB) or other hazardous materials as required by Facilities Services personnel or by separate contract.
- D. Schedule ten (10) days of slack or "down" time for the removal of hazardous materials without penalty to Owner for the delay of the Contract.

1.05 LEAD BASED PAINT

- A. The Owner may have tested existing paint in the project area and if levels are found the following conditions apply.
- B. Contractor shall remove paint as specified for surface preparation and capture

removed material for disposal.

- C. Contractor shall follow OSHA guidelines involving exposure to workers.
- D. Owner will provide containers for Contractor's use at project site.
- E. Contractor shall comply with the requirements of DEQ and EPA and shall submit a lead abatement plan.
- F. Contractor shall separate lead contaminated material from effluent and water.
- G. Owner will dispose of lead paint and effluent resulting from stripping operation.
- H. Soil contaminated by stripping operations shall be replaced with topsoil.

END OF SECTION

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for unit prices.
2. Measurement and payment criteria applicable to Work performed.

1.02 DEFINITIONS

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

1.03 PROCEDURES

- A. Unit prices include necessary material, plus cost for delivery, installation, insurance, applicable taxes, 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. Take measurements and compute quantities for Unit Price items as Work proceeds. Maintain log for Owner review. When requested by Owner, provide equipment and personnel necessary to assist in field verification of measurements and quantities.
- D. Owner reserves 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.
- E. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in schedule contain requirements for materials described under each unit price.

1.04 UNIT PRICE ADJUSTMENTS TO CONTRACT SUM

- A. Make written request to Owner and Architect to adjust Contract Sum through Contract modification procedures required by Conditions of the Contract for Unit Price Work.
- B. Submit complete quantity breakdown made on basis of actual measurement and quantity, accepted by Owner and Architect, multiplied by Unit Price in Unit of Measure stated by Bidder on Form of Proposal.

- C. Adjustment to Contract Sum will be determined by Unit Price of actual Work incorporated into, or deleted from, estimated quantity of Work, as established and verified by Owner.
- D. Payment will not be made for the following:
 - 1. Products and materials disposed of in an unacceptable manner.
 - 2. Products and materials determined unacceptable prior to or after installation or placement.
 - 3. Products and materials not completely unloaded from transporting vehicle.
 - 4. Excess product and materials after completion of Work.
 - 5. Loading, hauling, and disposing of rejected products and materials.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE OF UNIT PRICES

- A. Unit Price 1A: Acoustical Ceiling Tile Reinstall.
 - 1. Description: Remove, salvage, and reinstall existing ceiling 12" x 12" tile, lighting, ceiling mounted equipment, and suspension system at interior areas of the Work where structural, mechanical, or electrical Work is needed within ceiling cavity, not otherwise indicated on Drawings.
 - 2. Unit of Measurement: Square feet.
- B. Unit Price 1B: Acoustical Ceiling Panel.
 - 1. Description: Remove and replace existing ceiling tile (12"x12" or 2 ft x 4 ft depending on location), lighting, and suspension system at interior areas of the Work where structural, mechanical, or electrical Work is needed within ceiling cavity, according to Section 095113 - Acoustical Ceiling Panel, not otherwise indicated on Drawings. Remove, salvage, and reinstall other existing ceiling mounted equipment.
 - 2. Unit of Measurement: Square feet.
- C. Unit Price 2: Gypsum Board Ceilings.
 - 1. Description: Remove and replace existing gypsum board ceilings, soffits and suspension system at interior areas of Work where structural, mechanical, or electrical Work is needed within ceiling cavity, according to Section 092900 - Gypsum Board, not otherwise indicated on Drawings. Remove, salvage, and reinstall existing ceiling mounted equipment.
 - 2. Unit of Measurement: Square feet.
- D. Unit Price 3: Gypsum Board Walls.
 - 1. Description: Remove and replace existing gypsum board wall finish at interior Work areas where structural, mechanical, or electrical Work is needed within wall cavity according to Section 092900 - Gypsum Board, not otherwise indicate on Drawings. Remove, salvage and reinstall existing wall mounted equipment.

2. Unit of Measurement: Square feet.
- E. Unit Price 4: Concrete roof deck repair.
1. Description: Remove damaged spalling concrete and repair per Section 030130 - Maintenance of Cast in Place Concrete.
 2. Unit of Measurement: Square feet.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Alternates described in this Section may be exercised at the option of the Owner within 60 days of the execution of the Contract.
- B. It is generally the practice of the Owner to exercise alternates in numerical order.
- C. The Owner reserves the right to accept the alternates without regard to order or sequence; but such acceptance shall not impair the selection of a low, responsible and responsive bidder to whom the Contract may be awarded under an equitable bid procedure.

1.02 QUALITY ASSURANCE

- A. For each alternate which is accepted, coordinate the work of the various trades involved, and modify surrounding work as required to complete the project as intended.
- B. In the change-in-price figure for each alternate, include incidental costs which are attributable to adjustments in the work of other trades which may be required to achieve the contemplated and final conditions.
- C. Questions:
 - 1. If there is a question regarding the extent, scope, nature, or intent of the alternates, contact the Owner's Authorized Representative for clarification.
 - 2. Failure on the part of the Contractor to clarify any unclear items shall not relieve the Contractor of the responsibility for performing the selected alternates in accordance with the intent and requirements of the Project Manual and Drawings.
 - 3. The description of the alternates hereinafter is qualitative and not quantitative; the Contractor shall determine the quantities of labor and materials and the extent of same required to execute the selected alternates in accordance with the intent and requirements of the Project Manual and Drawings.
 - 4. The applicable Sections of the Specifications apply to the work under each alternate.

1.03 LIST OF ALTERNATES

- A. See Attached List of Alternates.

LIST OF ALTERNATES (SECTION 012300)

	Base Bid: Replace windows at West wall Auditorium.
1	Alternate: Remove and reinstall existing windows. See Sheet A5.21A - Exterior Window Details, Details 1 and 2.
	Base Bid: Remove and replace existing skylights with new skylights equipped with painted guardrails.
2	Alternate: Remove and reinstall existing skylights on new roof curb. Provide safety railing system.
	<p>Base Bid: Boiler B-1: Remove existing pneumatic system that serves VAV terminal units.</p> <p>Remove existing hydronic-heating VAV terminal units and replace with new electric-heating units.</p> <p>Remove and replace ducts downstream of VAV with new ducts with 2" acoustic ductliner. Duct size may increase to provide interior clearance and compensate for internal duct lining thickness.</p> <p>Remove hydronic heating components from Boiler B-1 (including the roof mounted boiler, piping, valves, supports, etc.).</p> <p>Remove hydronic heating components from Boiler B-2 (including the roof mounted boiler, piping, valves, supports, etc.).</p> <p>Base Bid: Salvage existing ceiling system materials for re-use.</p> <p>Remove existing ceiling grid and tiles, lighting, air grills and diffusers, replace with new suspended ceiling, lighting, grills, and diffusers.</p> <p>Remove and replace existing sprinkler heads and trim rings.</p> <p>Remove and re-install other existing ceiling mounted items.</p>
3	<p>Limited Demolition: Remove existing hydronic pipe within 5 ft of existing VAV terminal unit (approximately 8 ft x 8 ft around each VAV terminal unit). Cap and abandon pipe in place beyond terminal units.</p> <p>See Sheet MD1.01 Main Level Floor Plan – HVAC Demo, Detail 1 for hydronic pipe at VAV terminal units Detail 1.</p>

	See Sheet A8.11A Reflected Ceiling Plan – Lower Level, Detail 1 for ceiling access areas at VAV terminal units.
3A	<p>Alternate – Ceiling Work Area A: Lobby/ Gallery.</p> <p>Salvage existing ceiling system materials for re-use. Remove and reinstall existing ceiling in areas where work occurs (approximately 8 ft x 8 ft at each VAV terminal unit).</p> <p>See Sheet A8.11A Reflected Ceiling Plan – Lower Level, Detail 1.</p>
3B	<p>Alternate – Ceiling Work Area B: Meeting rooms and Shared Office.</p> <p>Salvage existing ceiling system materials for re-use. Remove and reinstall existing ceiling tile in areas where work occurs (approximately 8 ft x 8 ft at each VAV terminal unit).</p> <p>See Sheet A8.11A Reflected Ceiling Plan – Lower Level, Detail 1</p>
3C	<p>Alternate – Ceiling Work Area C: Admin Offices (Rooms 0132, 0133, 0134) and Meeting room (0101).</p> <p>Salvage existing ceiling system materials for re-use. Remove and re-install existing ceiling finish in areas where work occurs.</p> <p>See Sheet A8.11A Reflected Ceiling Plan – Lower Level, Detail 1</p>
3D	<p>Alternate – Ceiling Work Area D: Backstage.</p> <p>Salvage existing ceiling system materials for re-use. Remove and re-install existing ceiling finish in areas where work occurs.</p> <p>See Sheet A8.11A Reflected Ceiling Plan – Lower Level, Detail 1</p>
	Base Bid: Increase roof parapet height to conceal increased insulation. Refer to drawings. Exterior wall finish materials and parapet wall height increase varies for each roof level.
4	<p>Alternate: Additional parapet height increase for screen guardrail. Brick Veneer.</p> <ul style="list-style-type: none"> - Main roof top of parapet increases from working elevation 250'-4" to 251'-8". - See Sheet A5.51A – Exterior Details, Detail 1.
5	<p>Alternate: Additional parapet height increase for screen guardrail. MWP finish.</p> <ul style="list-style-type: none"> - Electrical Room roof top of parapet increases from working elevation 256'-4" to 258'-3".

	<ul style="list-style-type: none">- See Sheet A5.51A – Exterior Details, Detail 3
6	<p>Alternate: Additional parapet height increase for screen guardrail. MWP finish.</p> <ul style="list-style-type: none">- Auditorium roof top of parapet increase from working elevation 283'-0" to 284'-6"- See Sheet A5.51A – Exterior Details, Details 2 and 4.
7	<p>Alternate: Additional parapet height increase for screen guardrail. MWP finish.</p> <ul style="list-style-type: none">- Stairwell roof top of parapet increases from working elevation 270'-2" to 272'-2".- See Sheet A5.51A – Exterior Details, Detail 5.

END OF SECTION

SECTION 01 24 76

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes forms and procedures for progress payments.
- B. Related work specified elsewhere.
 - 1. For the primary discussion of payments, refer to OSU General Conditions, Section E, as supplemented.
 - 2. In compliance with OSU General Conditions, Section K, no payments beyond 75% will be made by the Owner before draft Operation and Maintenance Manuals have been received for review by the Owner.

1.02 APPLICATION FORMS

- A. For applications for payment, use sample Contract Payment Request (see below), contract payment request on company letterhead, or AIA Document G702, supported by AIA Document G703, Continuation Sheet, or similar document.
- B. Prepare the Schedule of Values in such a manner that each major item of Work and each subcontracted item of Work is shown as a line item broken down in terms of material and labor costs on AIA Document G703, Application Certification of Payment, Continuation Sheet or similar format. The sample continuation sheet shall be the minimum Schedule of Values breakdown.
- C. The Schedule of Values shall be submitted for review by the Owner prior to the first application for payment; and may be used when, and only when, accepted in writing by the Owner.
- D. Payment request is to include the Contractor's Federal Tax Identification number and return address.

1.03 PAYMENTS

- A. The Owner will make progress payments on account of the Contract once monthly for the scheduled duration of the project (i.e. three (3) payments on a three-month project), based on the value of work accomplished or materials on the job site, as stated in the Schedule of Values on the Application and Certificate Payment.
- B. Complete and forward Application to the Owner on or about the 15th day of each month for work performed the previous month and include certified payroll statements as specified in the OSU General Conditions.
- C. Submit one (1) copy of forms requesting payment to the Owner.
- D. Payments will be made on protected materials on hand at the job site properly stored,

protected, and insured.

- E. Estimated quantities shall be subject to the Owner's review and judgment.

1.04 EARLY PURCHASE AND PAYMENT OF MATERIALS AND EQUIPMENT

- A. Order materials and equipment requiring a long lead or waiting time early so as not to delay progress of the Work.
- B. The Contractor will be reimbursed for early order materials or equipment upon receipt and verification of quality and quantity against submittals and shipping documents by the Owner's Authorized Representative.
- C. Receipt shall be to the job site or stored at Owner's other premises in an orderly and safe manner, secured from normal weather damage.
- D. Security remains the responsibility of the Contractor.

1.05 ATTACHMENTS

- A. Contract Payment Request.
- B. Continuation Sheets.

END OF SECTION

CONTRACT PAYMENT REQUEST

DATE: _____

TO: University Financial Services
Oregon State University
850 SW 35th St.
Corvallis, OR 97333
FacServContracts@oregonstate.edu

Payment Request No. _____ Contract No. _____ Period from _____ to _____

Project: _____

Original Contract Amount\$ _____

Change Orders (Net Amount).....\$ _____

Contract Total to Date\$ _____

=====

Total Completed and Stored to Date\$ _____

Less Retainage (5%), if applicable\$ _____

Total Earned, Less Retainage (if applicable)\$ _____

Less Previous Payments\$ _____

Net Amount Due this Request.....\$ _____

The undersigned Contractor certifies that, to the best of his/her knowledge, information, and belief, the Work covered by this request has been completed in accordance with the Contract Documents, that all amounts have been paid for Work for which previous applications for Payment were issued and payments received from the Owner, and that the amount shown herein is now due.

Contractor: _____

By: _____ **Date:** _____

Federal Tax ID Number: _____

Address: _____

SECTION 01 25 00

PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General requirements for the Work in relation to substitutions and product options.
- B. Submit to the Owner's property insurance carrier shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.
- C. Related Work Specified Elsewhere
 - 1. Invitation to Bid.
 - 2. OSU General Conditions.

1.02 REQUESTS FOR SUBSTITUTIONS

- A. Requests for substitution of products in place of those specified shall be in accordance with Invitation to Bid, and as specified herein.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Investigate proposed products and determine that they are equal or superior in all respects to products specified.
- B. Provide same guarantee for accepted substitutions as for products specified.
- C. Coordinate installation of accepted substitutions into the Work, making such changes as may be required for the Work to be complete in all respects.

1.04 SUBSTITUTIONS DURING BIDDING

- A. Submit one electronic copy of the following information with each request to the Owner:
 - 1. Substitution request form provided below.
 - 2. Comparison of proposed substitution with product, material or system specified.
 - 3. Complete data, substantiating compliance of proposed substitution with the Contract Documents.
 - 4. Test numbers and supporting reports, indicating compliance with referenced standards.
 - 5. Evidence that warranty requirements are acceptable.
 - 6. Details indicating specific deviations proposed for the substitution.
 - 7. Reference and applicable Specification sections.
 - 8. Applicable product samples.
- B. All substitution requests shall be received in the Owner's office prior to the deadline for questions as identified in the Invitation to Bid. Requests received after this date

will not be considered.

1.05 SUBSTITUTIONS DURING CONSTRUCTION

- A. Substitutions will normally not be considered after date of Contract except when required due to unforeseen circumstances.
- B. Within a period of thirty (30) days after date of Contract, the Owner may, at its option, consider formal written requests for substitution of products in place of those specified, when submitted in accordance with the requirements stipulated herein.
- C. One or more of the following conditions must be documented in any such request:
 - 1. Required for compliance with final interpretation of code or insurance requirements.
 - 2. Required due to unavailability of a specified product.
 - 3. Required because of the inability of the specified product to perform properly or to fit in the designated space.
 - 4. Substitution would be substantially in the best interest of the Owner in terms of cost, time, or other considerations.

1.06 SUBSTITUTIONS NOT PERMITTED

- A. If implied on submittals without first requesting approval thereof.
- B. If acceptance will require substantial revision of the Contract Documents.

1.07 ATTACHMENTS

- A. Substitution Request Form.

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

SPECIFIED ITEM: _____

Section	Page	Paragraph	Description
---------	------	-----------	-------------

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by: _____

Signature _____

Firm _____

Address _____

Date _____

Telephone _____

Attachments: _____

For use by Design Consultant:

Accepted Accepted as noted

Not Accepted Received too late

By _____

Date _____

Remarks _____

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 PRE-CONSTRUCTION MEETING

- A. Architect/Engineer/Designer, Contractor and Owner will meet prior to start of the Work (within seven (7) days after notice to proceed) to discuss at least the following topics and any others of mutual interest.
1. Schedule of Values
 2. Permit Status/tree protection/erosion control
 3. List of sub-contractors
 4. Job inspections.
 5. Early purchase of, and/or lead time requirements for material and equipment/repurchase of equipment
 6. Monthly payment date/SOP for pay requests
 7. Portion of site to be occupied by construction.
 8. Parking/Staging areas
 9. Non-smoking campus requirements
 10. Maintenance of access and safety.
 11. Processing of field decisions and change orders
 12. Labor provisions/labor rates for subs
 13. Material submittals/deferred submittals
 14. Owner access during construction.
 15. Review of Contract Documents/review ADA requirements/cross-slopes
 16. Coordination procedures and separate contracts.
 17. Progress schedules.
 18. Critical Work sequencing.
 19. Safety and emergency procedures/24 hour contact numbers
 20. Security procedures.
 21. Hazardous materials.
 22. Progress meetings.
 23. Contract close-out.
- B. Location of Meeting: Project site

1.02 PROGRESS MEETINGS

- A. The Contractor will schedule and administer progress meetings and will:
1. Prepare agendas.
 2. Schedule progress meetings, frequency, time and day to be determined during pre-construction meeting.
 3. Make physical arrangements for and preside at meetings.
 4. Record minutes and include decisions.

5. Distribute copies of minutes to participants within four (4) days after meetings.
- B. Location of Meetings: Project site.
- C. Attendance:
1. The Owner or Owner's Authorized Representative.
 2. Contractor.
 3. Subcontractors affected by agenda.
 4. Project Architect/Engineer/as necessary.
 5. Owner will attend meeting to ascertain Work is expedited consistent with progress schedule and with Contract Documents.
- D. Minimum Agenda:
1. Review and approve minutes from previous meeting.
 2. Review Work progress since previous meeting.
 3. Discuss field observations, and problems.
 4. Review delivery schedules, construction schedule, and identify problems which impede planned progress.
 5. Review proposed changes.
 6. Material submittals.
 7. Note all new subcontractors performing Work at the job site.

END OF SECTION

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for the following:
 - a. Construction photographs.

1.02 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 3 days of taking photographs.
 - 1. Submit photos by uploading to web-based Project software site. Include copy of key plan indicating each photograph's location and direction.
 - 2. Project Image Contact Sheet.
 - a. Arrange images 3 across and 5 tall on 8 1/2 inches by 11 inches PDF sheets.
 - b. Show image file name.
 - 3. Identification: Provide the following information with each image in web-based Project software site:
 - 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.

1.03 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.
- B. Do not display photographs in publications without permission of Owner.

1.04 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, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in digital camera, without alteration, manipulation, editing, or modifications.
- C. Metadata: Record accurate date and time and GPS location data from camera.
- D. File Names: Name media files with date, Project area, and sequential numbering suffix.

1.05 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 commencement of Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Take 20 photographs to show existing conditions adjacent to property before starting Work.
 - 2. Take 20 photographs of existing buildings, assemblies, and materials, either on or adjoining property, to accurately record physical conditions at start of construction.
 - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- C. Concealed Work Photographs: Before proceeding with installing Work that will conceal other Work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including the following:
 - 1. Blocking, sheathing and insulation.
 - 2. Waterproofing and weather-resistant barriers.
 - 3. Roof decks.
- D. Periodic Construction Photographs: Take 20 photographs weekly coinciding with cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
 - 1. In addition to the monthly photographs, take photos from Owner approved locations weekly to show the progress of construction. Clearly label photos and upload to selected locations

- E. Pre-Cover Photographs: Take exterior pre-cover photographs of each stage of partial mockups prior to application of subsequent materials, from existing substrate to final finish material and sheet metal.
1. The purpose of exterior pre-cover photographs is to visually document locations and dimension of building components for architect's review prior to application of cover components and finishes. Pre-cover photographs will become a tool for building maintenance and aid in future renovations and trouble.
 2. Failure to provide adequate photographs of the assembly components for Architect's review will result in removal of assembly components by the contractor to allow visual inspection of the Work, and repair and reconstruction by the contractor to like-new condition.
- F. Final Completion Construction Photographs: Professional photographer to take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect to determine vantage points.
1. Submit through Multivista, or accepted cloud-based equivalent.
 2. Include date stamp.
- G. Additional Photographs: Architect may request photographs in addition to construction photographs. Additional photographs to be paid for by Change Order.
1. At least 3 days notice will be given prior to photographs being taken.
 2. Emergency Situations: Take additional photographs within 24 hours of request.
 - a. Circumstances that could require additional photographs include the following:
 - 1) Special events planned at Project site.
 - 2) Immediate follow-up when on-site events result in construction damage or losses.
 - 3) Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - 4) Substantial Completion of a major phase or component of Work.
 - 5) Extra record photographs at time of final acceptance.
 - 6) Owner's request for special publicity photographs.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, SAMPLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submit to the Owner shop drawings, samples, and product data (such as manufacturer's standard schematic drawings and other literature) when required by individual Specifications sections.
- B. Related Work Specified Elsewhere
 - 1. OSU General Conditions.

1.02 SUBMITTAL SCHEDULING

- A. For items requiring review by the Owner only, submittals shall be sent to the Owner at least 15 calendar days before the date each is required for fabrication or installation.
- B. Submittals to be reviewed by Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.
- C. Submittals to be reviewed by Owner's property insurance carrier shall be sent to Owner as directed in individual specification sections.
- D. Submittals involving Substitution requests or other modifications requiring review by the Owner and/or the Owner's consultants shall be sent to the Owner at least 20 calendar days before the date each is required for fabrication or installation.

1.03 SUBMITTAL CONTENT AND FORMAT

- A. General Requirements:
 - 1. Shop Drawings: Submit in electronic format and, if requested by Owner's Authorized Representative, submit one reproducible transparency and 1 print of each drawing.
 - 2. Product Data: Submit electronically, and if requested by Owner's Authorized Representative, up to 6 hard copies.
 - 3. Samples: Submit the number and type stated in each Specification Section, or a minimum of three if not otherwise noted. Submit a minimum of three sets of color samples where color selection is required.
 - 4. Submittals shall include:
 - a. Date and revision dates return date requested.
 - b. Project title and number.
 - c. The names of the Contractor, subcontractor, supplier, and manufacturer.
 - d. Identification of product or material, with Specification Section number.
 - e. Relation to adjacent critical features of work or materials.
 - f. Field dimensions, clearly identified as such.

- g. Applicable standards, such as ASTM number or Federal Specification.
 - h. Identification of deviations from Contract Documents, and for products accompanied by Substitution request as required by Section 01 25 00.
 - i. Contractor's stamp legibly signed, essentially as follows:
 - 1) The undersigned, acting on behalf of the Contractor, certifies that this submittal has been reviewed and is approved; products have been verified as being as specified, field measurements and field construction criteria have been or will be coordinated, and the submittal is in compliance with Contract Documents.
5. Re-submission Requirements:
- a. Revise initial drawings as required and resubmit as specified for initial submittal.
 - b. Indicate on drawings any changes which have been made other than those requested by the Owner or the owner's consultants.
6. The Owner may return without review any submittal not meeting the requirements listed above.
- B. Shop Drawings:
1. Present data in a clear and thorough manner.
 2. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Documents.
 3. Structural items shall be identified by location in the completed structure. Identify details by reference to contract sheet and detail numbers.
 4. Minimum sheet Size: 8 ½ x 11".
- C. Product Data:
1. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:
 - a. Clearly mark each copy to identify pertinent product or models.
 - b. Show dimensions, weights, and clearances required.
 - c. Show performance data consisting of capabilities, ROM, KW, pressure drops, design characteristics and consumption; conforming as closely as possible to the test methods referenced in the Plans and Specifications.
 - d. Show wiring or piping diagrams and controls.
 2. Manufacturer's standard schematic drawings and diagrams:
 - a. Modify to delete information which is not applicable.
 - b. Supplement standard information to provide information specifically applicable to the Work.
- D. Samples:
1. Insure that samples are of sufficient size to indicate the general visual effect or color.
 2. Where samples must show a range of color, texture, finish, graining, or other property, submit sets of pairs illustrating the full scope of this range.

3. One (1) sample or one (1) set of approved samples will be retained by the Owner; final work will be measured against approved samples.

1.04 QUALITY ASSURANCE

- A. Process submittals in ample time for review, as applicable, so as to not delay the Work. All submittals shall be received by the Owner within ten (10) days after pre-construction.

1.05 DEFINITIONS

- A. The Owner will mark reviewed materials as follows:
 1. "No Exception Taken," which means fabrication, manufacture and/or installation may proceed.
 2. "Make Revisions Noted," which means fabrication, manufacture and/or installation may proceed with revisions as noted.
 3. "Revise and Resubmit," which means that fabrication, manufacture and/or installation may not proceed.
 4. "Rejected," which means do not proceed; make arrangements for the review of the proposed Work with the Owner as soon as possible.

1.06 PROCESSING

- A. Review submittals, make necessary corrections, and become familiar with the content of the submittals.
- B. Mark each item with Contractor's stamp.
- C. Accompany submittals with a transmittal letter bearing the project name, Contractor's name, number of items, and other pertinent data.
- D. Keep one copy of each reviewed submittal on the job site at all times.
- E. Be responsible for obtaining and distributing prints of shop drawings to the various suppliers, and the Owner once review process has been completed. Make prints of reviewed shop drawings only from transparencies which carry the appropriate stamp and endorsement.

END OF SECTION

SECTION 013573 - DELEGATED DESIGN PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Procedures for performing Delegated Design portions of Work.

1.02 DEFINITIONS

- A. Delegated Design: Contractor to assume responsibility for defined elements or portions of Work to conform to provided performance criteria, aesthetics and building codes. Coordinate and assume responsibility for design, calculations, submittals, permits if required, fabrication, delivery, storage and installation of components.
- B. Deferred Submittal: Portions of Work not submitted at time of permit application and are submitted to the building official or AHJ within a specific time period after permit application.
- C. Delegated Design Components: Complete, operational systems, provided for their intended use matching Architect's aesthetic design intent as described in Project Manual and Drawings.
- D. Applicant: Person applying for building permit and person coordinating Contractor Engineered systems with basic building and with each other. Includes coordination of required submittals.
- E. AHJ: Authority Having Jurisdiction.
- F. Delegated Design Engineer: Professional Engineer registered in state of Project location engaged by Contractor to provide Drawings, computations, and specifications required by AHJ for Delegated Design system.
- G. Seal: Certification that Drawings, computations, and specifications were designed and prepared under direct supervision of Architect or Engineer whose name appears thereon.
- H. Delegated Design Component Review Stamp: Confirmation that design Drawings have been reviewed for compatibility with design of the building.
- I. Review Stamp: Certification that Architect has reviewed Drawings, computations and specifications bearing seal of Delegated Design Engineer, verifying conformance with information given and design concept set forth in Drawings and Specifications.
- J. Approval Stamp: Certification that AHJ has reviewed submittal and finds it acceptable with respect to applicable code compliance.

1.03 ACTION SUBMITTALS

- A. Delegated Design Component Submittals: Include the following with submittals:

1. Performance criteria as specified in Specifications and Drawings.
2. Design assumptions.
3. Details.
4. Calculations.
5. Structural elements certified by Delegated Design Engineer.
6. Instructions for fabrication, assembly, installation, and interface with other trades.

- B. Proposed Delegated Design Engineers: Submit list of engineers proposed for performing delegated design engineering a maximum of 15 days after executing Notice to Proceed.

1.04 SUBMITTAL REQUIREMENTS

- A. Components are those subject to lateral or vertical loads and are not designed by Architect.

1. These components require designing by Delegated Design Engineer who received subcontract or purchase order for component of Project.

- B. Coordinate components adjunct systems whether designed by Architect or others.

- C. Design components to align with specifications and Drawings to greatest possible extent.

- D. Building Department Submittals:

1. Provide submittals to Architect and Owner for General Design Conformance review prior to submitting to Building Department.
 - a. Update submittals based on comments from Architect prior to Building Department submission.
2. Submit 3 sets of Drawings and Specifications through online Project Portal clearly showing members, dimensions, connections, and materials, and in, attached to main structure.
 - a. Design and prepare Drawing stamped by Delegated Design Engineer.
 - b. Drawings require signature indicating General Design Conformance by Architect.
 - c. Shop Drawings or erection Drawing not acceptable for above requirements.
3. Submit 1 set of calculations, including criteria, design assumptions, substantiating computations, and additional data, sufficient to show correctness of Drawings and compliance with structural revisions of Structural Specialty Code for the State in which the Project is located.
 - a. Prepare calculations stamped by Delegated Design Engineer who prepared Drawings and is licensed in the state where Project is located.
 - b. Calculations require signing by Architect indicating acceptance of design concepts, loading criteria and compatibility of designs.

- E. Before Work is allowed to proceed the following must occur:

1. Submit complete legible documents.
2. Documents must be examined and approved by Building Department.

- F. Documents not completed prior to issuance of building permit, must be completed and submitted for approval prior to fabrication.
- G. Complete and submit list of Delegated Design Engineers' names, addresses, and telephone numbers prior to issuance of Components approval.

1.05 QUALITY ASSURANCE

- A. Refer to specific Sections for Delegated Design Components.
 - 1. Quality Assurance described in specification Sections shall be minimum acceptable standards for Project.
 - 2. Should quality assurance not be defined within Specifications Sections, printed industry standards for "normal" quality practices shall govern.
- B. Owner Responsibilities:
 - 1. Owner will not pay for progress delays, additional products, additional Work, restocking, or reworking required by Contractor's failure to coordinate Delegated Design work with Project Work.
- C. Contractor Responsibilities:
 - 1. Coordinate and assume complete responsibility for design, documentation, engineering, calculations, submittals, permits, fabrication, transportation, and installation of this Work.
 - 2. Submit and coordinate Delegated Design documents to Authority Having Jurisdiction (AHJ) for separate permit.
 - 3. Perform design and prepare design Drawings under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State in which the Project is located.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Architect's review of Delegated Design Engineered submittals is for general conformance with design intent.
 - 1. Architect not responsible for coordination of Delegated Design components with Contract Documents or review of materials submitted as result of Delegated Design components.
 - 2. Contractor may verify design intent of Contract Documents with Architect.
- B. Owner not responsible to pay for delays, additional products, hours of work or overtime, restocking or rework required due to failure to coordinate work with other trades or to provide components in timely manner to meet Project Schedule.

2.02 SPECIFIC REQUIREMENTS

- A. Delegated Design Components shown in contract Documents are shown for design intent.
- B. Intent is to have Delegated Design Entity responsible to design, provide, coordinate and install Delegated Design Component.
- C. Delegated Design Components are to include products specified.
- D. Delegated Design Components attached to structural frame or supplemental to structural frame to be designed for anticipated loads outlined on Structural Drawings or found in Building Code, in which Project is located.
- E. Coordinate Delegated Design Components with appropriate subcontractors.
- F. Load reactions at interface between Delegated Design Components and structural frame to be clearly defined to allow for a review by Engineer of Record.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS AND SYMBOLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

A/C	air conditioning	CB	catch basin
AB	anchor bolt	CEM	cement
AC	asphaltic concrete	CF	cubic foot
ACT	acoustical tile	CFOI	contractor furnished owner installed
AD	area drain	CG	corner guard
ADD	addendum	CH	ceiling height
ADD'L	additional	CI	cast iron
ADH	adhesive	CJ	control joint
AFF	above finish floor	CKBD	chalkboard
AGG	aggregate	CL	centerline
AL	aluminum	CLG	ceiling
ALLOW	allowable	CLR	clear(ance)
ALT	alternate	CM	construction manager
ANOD	anodized	CMT	ceramic mosaic (tile)
AP	access panel	CMU	concrete masonry unit
APPRX	approximate	COL	column
ARCH	architect(ural)	COM	communications
ASPH	asphalt	CONC	concrete
AUTO	automatic	CONN	connect(ion)
AVE	avenue	CONST	construction
BD	board	CONT	continuous or continue
BIT	bituminous	CONTR	contract(or)
BLDG	building	CPT	carpet
BLKG	blocking	CRS	course(s)
BM	bench mark, beam(s)	CS	countersink
BOT	bottom	CSMT	casement
BRZ	bronze	CT	ceramic tile
BS	both side	CTR	center

CVG	clear vertical grain	EX.EXIT	existing
CW	cold water	EXH	exhaust
CWT	ceramic wall tile	EXP	exposed
CY	cubic yard	EXT	exterior
D	depth	FA	fire alarm
DEMO	demolish, demolition	FAF	fluid applied flooring
DEP	depressed	FARF	fluid applied resilient floor
DF	drinking fountain	FAS	fasten, fastener
DIA	diameter	FBD	fiberboard
DIAG	diagonal	FBT	finished blowing temperature
DIM	dimension	FD	floor drain, fire damper
DISP	dispenser	FE	fire extinguisher
DIV	division	FEC	fire extinguisher cabinet
DL	dead load	FF	factory finish
DMT	demountable	FGL	fiberglass
DN	down	FHMS	flathead machine screw
DP	dampproofing	FHWS	flathead wood screw
DR	door	FIN	finish(ed)
DS	downspout	FLCO	floor cleanout
DT	drain tile	FLR	floor(ing)
DTL	detail	FLUR	fluorescent
DW	dumbwaiter	FND	foundation
DWG	drawing(s)	FOC	face of concrete
DWR	drawer	FOIC	furnished by owner/installed by contractor
EA	each	FOIO	furnished by owner/installed by owner
EB	expansion bolt	FOM	face of masonry
EF	each face	FP	fireproofing, flash point
EJ	expansion joint	FPHB	freeze-proof hose bib
EL	elevation	FR	fire resistive, fire rated
ELEC	electric(al)	FRM	frame(d), (ing)
EMBED	embedment	FS	full size
EMER	emergency	FSS	finished structural slab
ENCL	enclose(ure)	FT	foot
EP	electrical panel board	FTG	footing
EQ	equal	FTS	finished topping slab
EQUIP	equipment	GA	gage, gauge
EST	estimate	GALV	galvanized
EVT	equiviscous temperature	GB	grab bar or gypsum board
EW	each way		
EWC	electric water cooler		

GC	general contractor	LAV	lavatory
GI	galvanized iron	LBS	pounds
GL	glass, glazing		
GLS	glass resin wall surfacing	LH	left hand
GP	gypsum	LL	live load
		LONGIT	longitudinal
HB	hose bib	LP	low point
HBD	hardboard	LW	lightweight
HC	hollow core		
HD	heavy duty	MAX	maximum
HDR	header	MB	machine bolt
HDW	hardware	M. MECH	mechanic(al)
HM	hollow metal	MFR	manufacture(r)
HOR	horizontal	MH	manhole
HP	high point	Min	minimum, minute
HR	hour	MISC	miscellaneous
HT	height	MO	masonry opening
HTG	heating	MO#	model number
HVAC	heating, ventilating, air conditioning	MOD	modular
HWD	hardwood	MPH	miles per hour
HWH	hot water heater	MS	machine screw
		MTL	metal
ID	inside diameter, identification	MULL	mullion
IN	inch	MWP	membrane waterproofing
INCIN	incinerator		
INCL	include(d), ion)	NAT	natural, natural finish
INT	interior	NIC	not in contract
INV	invert	NO	number
		NOM	nominal
		NTS	not to scale
JB	junction box		
JC	janitor's closet	OA	overall
JT	joint	OBS	obscure
		OC	on center(s)
KD	kiln dried	OD	outside diameter
KCP	Keene's cement plaster	OF	overflow
KO	knockout	OFCI	owner furnished contractor installed
KP	kick plate		
		OFOI	owner furnished owner installed
LAB	laboratory	OHMS	ovalhead machine screw
		OHWS	ovalhead wood screw
LAM	laminated	OPG	opening

OPP	opposite	SEC	section
OZ	ounce(s)	SF	square feet (foot)
		SHT	sheet
P	paint(ed)	SHTHG	sheathing
PB	push button	SIM	similar
PCF	pounds per cubic foot	SL	sleeve
PCP	putting coat plaster	SOG	slab on grade
PERF	perforate(d)	SPEC	specification(s)
PL	plate, property line	SQ	square
PLAM	plastic laminate	SS	storm sewer
PLAS	plaster	S4S	finished 4 sides
PNL	panel	SD	storm drain
PP	push plate	ST	steel, street
PR	pair	ST ST	stainless steel
PREP	prepare	STD	standard
PSF	pounds per square foot	STR	structural
PSI	pounds per square inch	SUPP	supplement
PT	point, pressure treated	SUPT	support
PTN	partition	SUSP	suspended
PVC	polyvinyl chloride	SV	sheet vinyl
PWD	plywood		
		T	tread
QT	quarry tile	TBM	top bench mark
		T&G	tongue and groove
R	rise	TB	towel bar
RA	return air	TC	top of curb
RAD	radius	TEL	telephone
RCP	reflected ceiling plan	TEMP	tempered
RD	roof drain	THK	thickness
REF	reference	TKBD	tackboard
REFR	refrigerator	TO	top of
REINF	reinforce(ing)	TP	top of paving
REQ	required	TRANS	transverse
RET'G	retaining	TS	top of slab
REV	revision(s), revised	TV	television
RH	right had	TW	top of wall
RM	room	TYP	typical
RO	rough opening		
RSF	resilient sheet flooring	UNO	unless noted otherwise
SC	solid core	VAT	vinyl asbestos tile
SCHED	schedule	VB	vapor barrier

VCT	Vinyl Composition Tile	WC	water closet
VERT	vertical	WD	wood, wood finish
VG	vertical grain	WP	waterproof(ing)
VIF	verify in field	WNS	wainscot
VWC	vinyl wall covering	WR	water resistant
		WS	waterstop
W	width, wide, water	WW	window wall
W/	with	WWC	wood wall covering
W/O	without	WWF	woven wire fabric

B. Words which may be found elsewhere in the Project Manual and Drawings are abbreviated in accordance with the standards set forth in the following table:

&	and
λ	angle
@	at
ι	diameter, round
"	inches
:	is, shall b
'	feet
ζ	perpendicular
/	per
%	percent
#	pound, number
X	by (as in 2 by 4)

END OF SECTION

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SECTION 01 42 16

DEFINITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Words which may be found elsewhere in the Contract Documents are defined in accordance with the standards set forth in the following table:

Approve:

Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be limited to the Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contract requirements.

As Detailed, As Shown:

Where "as detailed", "as shown" or words of similar importance are used, it shall be understood that reference to the Drawings accompanying the Specifications is made unless otherwise stated.

As Directed, As Required, As Authorized, As Reviewed, As Accepted:

Where "as directed", "as required", "as authorized", "as reviewed", "as accepted" or words of similar importance are used, it shall be understood that the direction, requirement, permission, authorization, review, or acceptance of the Architect is intended, unless otherwise stated.

As Indicated:

Where "as indicated" is used it shall be understood that reference to Drawings and/or Specifications is made unless otherwise stated.

Directed, Requested, etc.:

Terms such as "directed," "requested," "authorized," "selected," will be understood as "directed by Architect," "requested by Architect," and similar phrases shall not be interpreted to extend Architect's responsibility into Contractor's responsibility for construction supervision.

Furnish:

Except as otherwise defined in greater detail the term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

Indicated:

The term "indicated" is a cross-reference to graphic representations, notes or schedules on

drawings, to other paragraphs or schedules in the specifications and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference and no limitation of location is intended except as specifically noted.

Install:

Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

Installer:

The term "installer" is defined as the entity (person or firm) engaged by Contractor, or its subcontractor or sub-subcontractor for performance of a particular unit of Work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

Provide:

Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality Assurance.
- B. Location of References.
- C. Schedule of References.

1.02 QUALITY ASSURANCE

- A. For products or quality of work specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. General Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable standards of the construction industry have the same force and effect as if bound or copied directly into Contract Documents.
- D. Such standards are made a part of the Contract Documents by reference.
- E. Individual sections indicate which codes and standards the Contractor must keep at the project site, available for reference.
- F. Referenced industry standards take precedence over standards which are not referenced but recognized in industry as applicable.
- G. Non-referenced standards are not directly applicable to the Work, except as a general requirement of whether the Work complies with standards recognized in the construction industry.

1.03 LOCATION OF REFERENCES

- A. Valley Library, Oregon State University.

1.04 SCHEDULE OF REFERENCED ASSOCIATIONS

AIA	American Institute of Architects WWW.AIA.ORG
AISC	American Institute of Steel Construction WWW.AISC.ORG
ANSI	American National Standards Institute WWW.ANSI.ORG
APA	American Plywood Association WWW.APAWOOD.ORG
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers WWW.ASHRAE.ORG
ASTM	American Society for Testing and Materials WWW.ASTM.ORG
AWPA	American Wood Protection Association WWW.AWPA.COM
AWS	American Welding Society WWW.AWS.ORG
BIA	Masonry Institute of America WWW.MASONRYINSTITUTE.ORG
BOLI	Oregon Bureau of Labor and Industries WWW.BOLI.STATE.OR.US
CCB	Construction Contractors Board WWW.OREGON.GOV.CCB/
CDA	Copper Development Association

	WWW.COPPER.ORG
CISPI	Cast Iron Soil Pipe Institute WWW.CISPI.ORG
CSI	Construction Specification Institute WWW.CSINET.ORG
DEQ	Department of Environmental Quality (Oregon) WWW.OREGON.GOV/DEQ/
DHI	Door and Hardware Institute WWW.DHI.ORG
DOT	Department of Transportation WWW.DOT.GOV
EPA	U.S. Environmental Protection Agency WWW.EPA.GOV
FM	Factory Mutual System WWW.FMGLOBAL.COM
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) WWW.GSA.GOV/PORTAL/CONTENT/103856
IBC	International Building Code WWW.ICCSAFE.ORG
ICBO	International Conference of Building Officials PUBLICECODES.CITATION.COM/ICOD/IBG/INDEX.HTM
IRS	Internal Revenue Service WWW.IRS.GOV
ISA	Instrumentation Systems and Automation Society WWW.ISA.ORG
NAAMM	National Association of Architectural Metal Manufacturers WWW.NAAMM.ORG

NBFU	National Board of Fire Underwriters WWW.NFPA.ORG
NEC	National Electric Code WWW.NECPLUS.ORG
NEMA	National Electrical Manufacturers' Association WWW.NEMA.ORG
NESC	National Electrical Safety Code WWW.IEEE.ORG
NFPA	National Fire Protection Association WWW.NFPA.ORG
NRCA	National Roofing Contractors' Association WWW.NRCA.NET
OAR	Oregon Administrative Rules ARCWEB.SOS.STATE.OR.US/404.HTML
OESP	State of Oregon Electrical Specialty Code http://www.bcd.oregon.gov/programs/online_codes.html
ORS	Oregon Revised Statutes LANDRU.LEG.STATE.OR.US/ORS/
OSHA	Occupational Safety and Health Administration WWW.OSHA.GOV
OSSC	Oregon Structural Specialty Code http://www.bcd.oregon.gov/programs/online_codes.html
PS	Product Standard STANDARDS.GOV/STANDARDS.CFM
SDI	Steel Door Institute WWW.STEELDOOR.ORG
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association WWW.SMACNA.ORG

SPRI	Single Ply Roofing Institute WWW.SPRI.ORG
SSPC	Steel Structures Painting Council WWW.SSPC.ORG
SWRI	Sealing, Waterproofing and Restoration Institute WWW.SWIRONLINE.ORG
UBC	Uniform Building Code (See ICBO)
UFC	Uniform Fire Code WWW.NFPA.ORG
UL	Underwriters' Laboratories, Inc. WWW.UL.COM
UMC	Uniform Mechanical Code WWW.UBC.COM
UPC	Uniform Plumbing Code WWW.UBC.COM
WHL	Warnock Hersey Laboratories WWW.INTEK.COM/MARKS/WH/
WCLIB	West Coast Lumber Inspection Bureau WWW.WCLIB.ORG
WWPA	Western Wood Products Association WWW.WWPA.ORG

END OF SECTION

SECTION 014339 - MOCKUPS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for quality assurance and quality control of mockups.
2. Partial markups.

1.02 DEFINITIONS

- A. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and 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 are not Samples. Unless otherwise indicated, approved mockups establish the standard by which Work will be judged.

1. Partial Mockups: Mockups of specific assemblies, items or finishes.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
2. Schedule times for tests, inspections, and similar activities.

B. Preinstallation Meetings: Conduct meetings at Project site.

1. Timing: A minimum of 7 days prior to starting construction of mockups.
2. Attendees: Owner, Architect, Contractor, specialist, supplier, installer, testing agent, and other entities involved in construction of respective mockups. Participants to be familiar with Project and authorized to conclude matters relating to Mock-up Work.
3. Project Schedule: Verify availability of materials, Installer's personnel, equipment, and facilities needed for each Mock-up.
4. Review materials, methods, and procedures related to mockups.
5. Review required testing, inspecting, and certifying procedures.

C. Scheduling:

1. Allow sufficient time in Project schedule for construction of mockups to allow testing, modifications to failed mockups, and retesting, in addition to obtaining Architect's approval to avoid delays in Project schedule.
 - a. Update Construction Schedule to reflect required revisions to mockups.
2. Do not proceed with ordering of materials or start building construction until mockups have been approved by Architect.

1.04 ACTION SUBMITTALS

A. Shop Drawings: For Partial Mockups.

1. Include plans, sections, and elevations, indicating materials and size of Mock-up construction.
2. Include the following in Shop Drawings:
 - a. Half size details of conditions for every member, joint, anchorage, weld size, glazing system, wall panel system, and provisions for expansion and contraction and sealant application.
 - b. Axonometric drawings for conditions difficult to illustrate in 2 dimensions.
 - c. Coordination details for related and adjoining Work. Insert templates and erection diagrams to completely describe and construct Mock-up.
3. Indicate manufacturer and model number of individual components.

1.05 MOCKUPS

A. General: Build mockups to verify selections made under Sample submittals and to demonstrate range of aesthetic effects and workmanship, and to set quality standards for fabrication and installation.

1. Build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for completed Work:
 - a. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - b. After Pre-installation Meeting as specified in individual Section, notify Architect and Owner 7 days in advance of dates and times when mockups will be constructed.
 - c. Employ supervisory personnel to oversee Mock-up construction. Employ workers that will be employed to perform same tasks during construction on Project.
 - d. Demonstrate proposed range of aesthetic effects and workmanship.
 - e. Perform testing on mockups according to requirements in Section 014000 - Quality Requirements.
 - f. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
 - 1) Allow 7 days for initial review and each re-review of each Mock-up.

- g. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - h. Demolish and remove mockups when directed unless otherwise indicated.
 - B. Partial Mockups: Construct partial mockups of selected items or finishes, complete. Provide digital photos of components and assembly sequence to Architect for review prior to covering with subsequent components. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work.
 - 1. Approved mockups may become part of completed Work if undisturbed at time of Substantial Completion unless indicated otherwise.

PART 2 - PRODUCTS

- A. Materials and Finishes, General: Incorporate products, materials, equipment, systems, and other items into mockups as indicated in individual Specification Sections.
 - 1. Comply with requirements specified in Contract Documents, and match previously submitted and approved Shop Drawings and Samples.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ensure areas indicated for mockups are ready to receive Work.
- B. Proceed with Mockups when each product, material, and component has been submitted for review and Approved Submittals have been returned.

3.02 INSTALLATION

- A. Build mockups incorporating products, materials, equipment, systems, and other items indicated in accordance with relevant Specification Sections.
 - 1. Locate as indicated in Contract Documents or at locations as directed by Architect.
- B. Approved Mockups to set quality and workmanship standards for final construction.
- C. Sequence installation to demonstrate that materials and systems forming exterior walls meet design intent.

3.03 FIELD QUALITY CONTROL

- A. Comply with Section 014500 - Quality Control and requirements of individual specification Sections of products, materials, and components included in mockups for testing and inspections of mockup Work.

- B. Testing Agency: Owner will engage a qualified testing agency to conduct tests and inspections required by authorities having jurisdiction.
- C. Correct deficiencies observed in mockups during testing, and repeat tests as required to comply with specified performance criteria and Contract Documents.
- D. If compliance with performance criteria is not achieved after 2 complete retests, completely rebuild mockups and begin entire retesting process.
- E. Once mockups comply with performance criteria and Contract Documents, incorporate corrective measures indicated by test report into related Shop Drawings and other submittals, and resubmit in compliance with specifications.
- F. Submit successful testing results and completed test reports to Owner and Architect. Obtain Architect's final acceptance of mockups in writing.

3.04 REPAIR

- A. General: On completion of inspection, and similar services, repair damaged construction and restore substrates and finishes on mockups indicated to remain in finished Work.
 - 1. Provide materials and comply with installation requirements specified in specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Repair is Contractor's responsibility, regardless of assignment of responsibility for quality control services.

3.05 CLEANING

- A. When authorized by Architect, demolish, remove, and legally dispose of Mock-up materials not indicated to remain in finished Work.

3.06 PROTECTION

- A. On completion of Mock-up Work, provide relevant protection of mockups indicated to remain in finished Work. Use protective materials properly suited for the various components.
- B. Protection is Contractor's responsibility, regardless of assignment of responsibility for quality control services.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Codes, regulations and permits.
- B. Procedures for quality control.

1.02 OWNER RESPONSIBILITIES

- A. Owner will employ and pay for services of an independent testing laboratory to perform inspection, sampling and testing as required by local building authority.
- B. Owner's Authorized Representative will provide on-site observation during construction.

1.03 CODES, REGULATIONS AND PERMITS

- A. All Work shall conform with the Oregon Structural Specialty Code (OSSC) based on the International Building Code (IBC), as amended by the State of Oregon Building Codes Division and the edition designated by the governing authority.
- B. Contractor shall comply with all applicable state and local construction codes.
- C. References to codes, Specifications and standards referred to in the Contract Documents shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of these Contract Documents.
- D. The Owner shall be responsible for all permits and City of Corvallis plan review fees; the Contractor shall be responsible for all licenses and associated fees required for the Project.
- E. Contractor shall arrange and attend all required permit inspections and furnish evidence of approved City inspection reports per Section 01 77 00.

1.04 QUALITY OF WORK

- A. It is the true and specific intent of these Specifications that quality of Work on all phases of the construction and embracing all the trade sections shall be of high quality performed by workers skilled in their trade and performing their Work only according to the standard of best practice of the trade.
- B. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with manufacturer's directions unless otherwise specified.
- C. If Work is required in a manner to make it impossible to produce first quality Work, or

should discrepancies appear among Contract Documents, request interpretation from Architect before proceeding with Work.

- D. Failure to secure interpretation may cause rejection by Architect or owner of installation.

1.05 LAYOUT

- A. Be responsible for properly laying out the Work and for lines and measurements for the Work.
- B. Verify the figures shown on the drawings before laying out the Work and report errors or inaccuracies to the Architect before commencing Work.

1.06 SUPERVISION

- A. The Contractor shall maintain effective supervision on the project at all times Work is being performed.
- B. The superintendent shall be the same person throughout the project and shall attend the preconstruction conference.

1.07 INSPECTIONS AND TESTING

- A. Contractor shall notify the Owner at least twenty-four (24) hours in advance of any required progress inspection or final inspection including final punch list inspection.
- B. Cooperate with laboratory personnel, provide access to Work and furnish incidental equipment material and labor required for field testing and sample taking.

1.08 EVALUATION OF TESTS AND INSPECTIONS

- A. Results of laboratory and/or field control tests and inspections shall be the principal basis upon which satisfactory completion of Work shall be judged.
- B. If results of tests and inspections indicate Work is below requirements of Contract Documents, that portion of Work is subject to rejection.

1.09 ADJUSTMENTS

- A. Remove and replace Work so rejected at Contractor's expense including costs of subsequent tests and inspections until Work meets requirements of Contract Documents.
- B. The Owner reserves the right to perform any testing as may be required to determine compliance with the Contract Documents.
- C. Costs for such testing will be the Owner's responsibility unless testing indicates noncompliance. Cost for such testing indicating noncompliance shall be borne by the Contractor.

- D. Noncomplying Work shall be corrected and testing will be repeated until the Work complies with the Contract Documents.
- E. Contractor will pay costs for retesting noncomplying Work.

END OF SECTION

SECTION 01 51 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security, and protection.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition".
- C. Electrical Service: Comply with NEMA, NEC and UL standards and regulations for temporary electric service; install service in compliance with National Electric Code (NFPA 70).
- D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use; obtain required certifications and permits if required.

1.03 PROTECTION

- A. Protect sidewalks, asphalt paving, concrete, trees, shrubs, and lawn areas at all times from damage resulting from construction activities.
- B. Prevent materials from clogging catch basins and yard drains; leave drains clean and in proper working condition.
- C. Protect Existing Irrigation Systems:
 - 1. In the event damage occurs to an underground irrigation system as a direct result of a Contractor's activities, the Contractor shall repair/replace or be assessed a charge at the discretion of the Owner.
 - 2. If repairs are to be made by the Contractor, the repairs will be inspected by the Owner's Authorized Representative prior to backfilling.
 - 3. Any galvanized pipe that requires repair shall be repaired at a threaded coupling, not by use of a compression coupling.
- D. Protect Existing Air Handling Systems:

1. Contractor shall be responsible for protection of the cleanliness of the existing air handling system at all times. This protection shall include:
 - a. During site work or building demolition, prefilters shall be provided and maintained on all building outside air intakes at all times throughout the construction duration.
 - b. During any interior work that may create dust in the interior space and adjacent corridor/hallways, air filters shall be provided and maintained on all affected air return and exhaust grilles. Where air flow in or out of the space is not required, all air duct openings shall be temporarily blanked off with plywood or sheet metal.
 - c. Prior to starting any work, the Contractor shall record and submit to the Owner's Authorized Representative, pressure readings across all existing air handler air filter banks before installation of new prefilters.
 - d. Upon completion of all Work affecting existing air handling systems, the Contractor shall remove all temporary filters, covers and associated parts and restore the system to its original operating condition unless otherwise stated elsewhere in the Contract Documents
- E. Clean, repair, resurface, or restore existing surfaces to their original, or better, condition, or completely replace such surfaces to match existing, where damaged by construction operations.
- F. Security is the responsibility of the Contractor.
- G. Construction Debris:
 1. Debris shall not be allowed to remain around the buildings during performance of Work, but shall be disposed of as rapidly as it accumulates.
 2. On completion of Work, the buildings and grounds shall be left in a condition that is equal to or better than original condition.
 3. In case of failure to do so, the Owner may remove rubbish and charge the cost to the Contractor.
- H. The Contractor shall manage a safe job environment for both the safety of all the people around the Work site as well as the safety of the Owner's and general public's property.
- I. The Contractor shall provide and maintain suitable barricades, shelters, lights, and danger signals during the progress of the Work; they shall meet the requirements of the local building code and OSHA.

1.04 DRAINAGE

- A. Verify that all rain drains in the construction areas are in working order and notify the Owner's Authorized Representative in writing of any rain drains that are plugged, prior to the start of the Work.
- B. Start of Work will be considered as acknowledgment that all drains are clear and in good working order.
- C. All drains shall be left in a clean and proper working condition.

1.05 CONSTRUCTION PROJECT SAFETY FORM

- A. Contractor shall submit to the Owner, prior to signing the Contract, the completed "Construction Project Safety Form", which is provided with instructions at the end of this Section.

1.06 TEMPORARY UTILITIES

- A. Temporary Utilities:
 - 1. Prepare a schedule indicating dates for implementation and termination of each temporary utility.
 - 2. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.
- B. Conditions of Use:
 - 1. Keep temporary services and facilities clean and neat in appearance.
 - 2. Operate in a safe and efficient manner.
 - 3. Take necessary fire prevention measures.
 - 4. Do not overload facilities or permit them to interfere with progress.
 - 5. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. Electrical Service:
 - 1. Service limited to 20 amp 120V circuits will be paid for by the Owner.
 - 2. Connection to the service shall be the responsibility of the Contractor, with the Owner's approval.
 - 3. Coordinate with the Owner's Authorized Representative.

D. Water Service:

1. Service in reasonable quantities for the Project will be paid for by the Owner.
2. Connection to the service shall be the responsibility of the Contractor, with the Owner's approval.
3. Coordinate with the Owner's Authorized Representative.

1.07 TEMPORARY SUPPORT FACILITIES

A. Temporary Sanitary Facilities:

1. Provide and maintain an adequate number of facilities for the use of all persons employed on the Work during construction.
2. Provide enclosed, weatherproof facilities with heat as required.
3. Use of new or existing Owner's facilities will not be permitted.

B. Temporary Heat and Ventilation:

1. As necessary, provide temporary heat and ventilation required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

C. Telephone Equipment: Provide telephone communications at project site.

D. Existing Services:

1. Do not interrupt any existing service.
2. Prior request and approval of the Owner's Representative will enable the Owner to shut down any utility required by the Work.
3. Contractor shall not shut down utilities.

1.08 TEMPORARY BARRIERS AND ENCLOSURES

- A. Provide barriers and fencing to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.
- B. Provide Commercial grade chain link fence construction.
- C. Provide 6 foot high fence around construction site as directed by Owner's Authorized Representative; equip with vehicular and pedestrian gates with lock.

- D. Exterior Closures: Provide temporary secured, weather-tight closures at exterior openings, to permit acceptable working conditions and protection of the Work.
- E. Interior Closures:
 - 1. Provide temporary floor to ceiling partitions (not plastic sheeting) and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to reduce construction noise, and to prevent damage to existing materials and equipment.
 - 2. Paint surfaces exposed to view from Owner occupied areas.

1.09 ODORS

- A. Work that causes excessive odors shall be performed only after coordination with the Owner's Authorized Representative. Filtering of air intakes to units may be required to prevent odors and vapors from entering the buildings.
- B. Contractor shall provide 7 days advance notice to the Owner's Authorized Representative in order for advance notice to be forwarded to building occupants. Work stoppage may occur if advance notification has not been coordinated or odors and vapors from the work are found to generate complaints from building occupants.

1.10 FIRE SAFETY

- A. Ensure that required exit routes remain unobstructed while building is occupied.
- B. Abide by all fire safety requirements for buildings under construction, alteration or demolition as required by Article 87, of the Uniform Fire Code as adopted by the State of Oregon.
- C. An emergency telephone shall be provided on site. Cellular telephone equipment is acceptable.
- D. Fire Suppression Equipment:
 - 1. Install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
 - 2. Maintain equipment in working condition with current inspection certificate attached to each.
 - 3. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

4. Store combustible materials in containers in fire-safe locations.
5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires.
6. Provide continual supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
7. When possible, relocate hot work to a designated hot work area.
8. If the materials or equipment cannot be relocated to a designated hot work area, use the least hazardous form of hot work that will get the job done and prepare the area properly.
9. Manage mobile hot work using the formal hot work permit system. (mentioned in the next bullet point and also a directive in the OSU Hot Work Safety Program)
10. Make sure both fire protection and hot work equipment work properly.
11. Train all personnel involved in hot work operations and activities so that they have the understanding, knowledge, and skills necessary to safely perform their jobs.

1.11 CONSTRUCTION AIDS

- A. Scaffolding: comply with applicable OSHA requirements.
- B. Material Handling Equipment:
 1. Provide necessary cranes, hoists, towers, or other lifting devices.
 2. Use only experienced operators.
 3. Remove equipment as soon as possible after task is ended.
 4. Coordinate placement of such equipment with Owner's Authorized Representative.
 5. Obtain required permits and meet requirement of governing authorities regarding applicable regulations.
- C. Materials or debris shall not be allowed to free fall from building.
- D. The use of chutes or conveyors must be approved by Owner.

1.12 TEMPORARY CONTROLS

- A. Water Control:
 1. Maintain excavations free of water.
 2. Provide, operate, and maintain necessary pumping equipment.

B. Protection:

1. Protect installed Work and provide special protection where specified in individual specification sections.
2. Prohibit traffic or storage upon waterproofed or roofed surfaces.

C. Security:

1. Provide security and facilities to protect Work and existing facilities and Owner's operations from unauthorized entry, vandalism, or theft.
2. Coordinate operations with Owner's Authorized Representative.

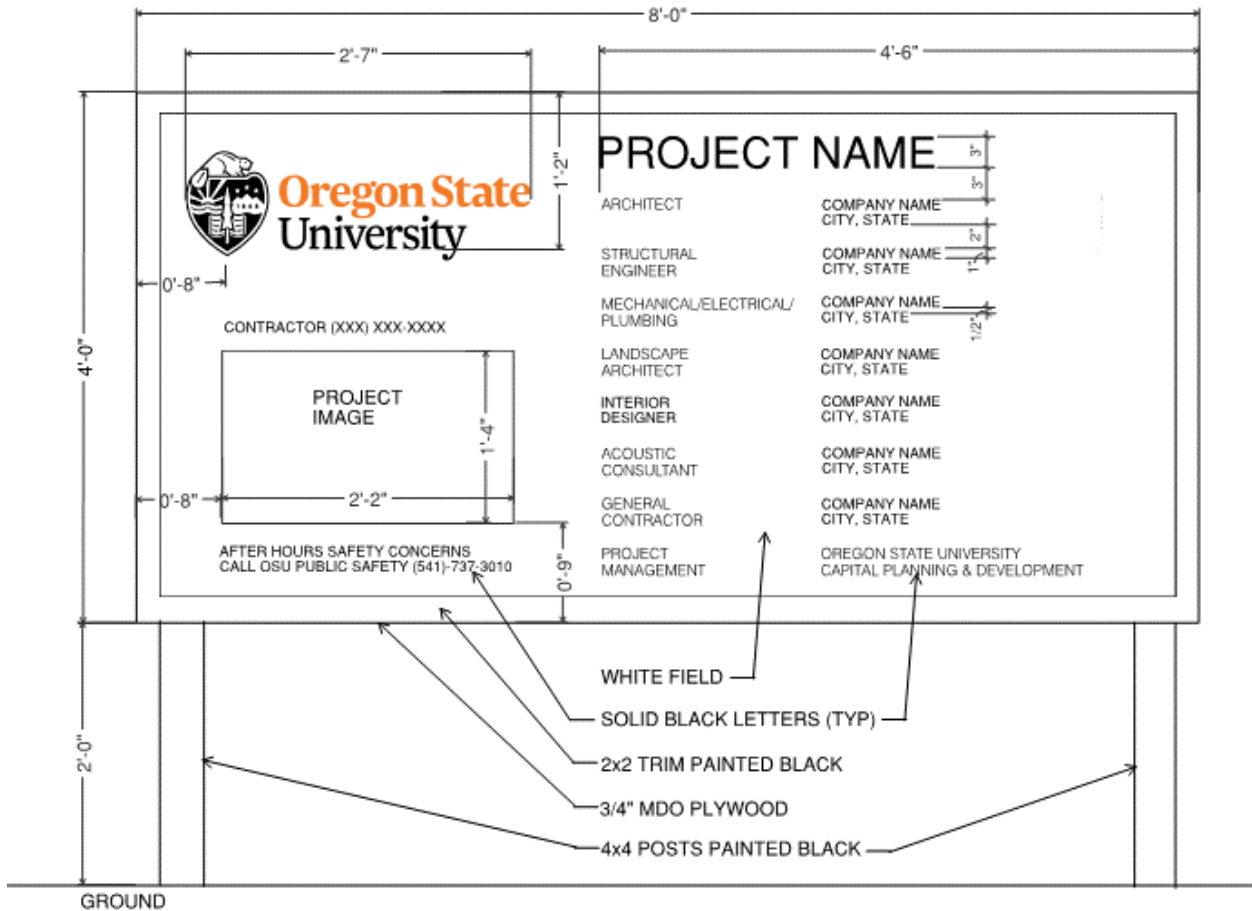
D. Temporary Traffic Control /Pedestrian Accessibility

1. A continuous route for all pedestrians, including persons with disabilities and bicyclists, shall be maintained at all times. When existing pedestrian facilities are disrupted, closed, or relocated in a construction zone, temporary pedestrian facilities shall be provided.
2. Temporary pedestrian facilities should be safe and accessible. There should be no curbs or abrupt changes in grade that could cause tripping or be a barrier to wheelchair use.
3. Signage shall be provided directing people to the temporary accessible route. The signage shall include the International Symbol of Accessibility.
4. Contractors shall not block temporary walkways with vehicles, equipment, construction materials, signs, trash, or other objects that might prohibit pedestrian passage.
5. Construction equipment and equipment operation must be separated from any open walkways. At construction zones, pedestrian fences or other protective barriers shall be provided to prevent access into the construction zone.

1.13 PROJECT SIGNAGE

- A. Contractor is permitted to post only one project identification sign based on the following example:

OSU TYPICAL JOB SIGN



1.14 PREPARATION

- A. Consult with Owner to review jobsite areas required for field offices, material storage and stockpiles, equipment storage, access to different locations, etc.

1.15 PERFORMANCE

- A. Confine equipment, apparatus, and storage of material to work limits. The Owner will not be responsible for protection of materials and equipment from damage, pilfering, etc.
- B. Install temporary facilities in such a manner that the installed work will not be damaged.
- C. Do not use facilities of existing building unless authorized in writing by the Owner.
- D. Effective September 1, 2012, OSU became a non-smoking campus and smoking is prohibited on all Campus property.

- E. Keep facilities well maintained.
- F. Relocate temporary facilities as required during job progress.
- G. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
 - 1. Replace air filters and clean inside of ductwork and housings.
 - 2. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
 - 3. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION

Oregon State University Construction and Maintenance Safety Requirements

EH&S, 100 Oak Creek Building, Corvallis, OR 97331-7405, (541) 737-2273, FAX (541) 737-9090

Complete OSU Construction and Maintenance Safety Form - Send completed documents (including Site Safety Plan and all separate answer pages) to Construction Contract Administration along with the signed contract and bonds.

Project Isolation - All construction and remodeling activities regardless of size and/or scope must be fenced, barricaded, or otherwise protected to restrict entrance and to ensure the safety of those in the general area. See isolation requirements.

Site Safety Plan - A site safety plan will be required and will address:

- General Information
- Emergency Information
- Key Organization Personnel
- Hazard Evaluation/Facility Impact
- Emergency Procedures
- Work Zones
- Security Measures
- Fire Protection

A model plan is attached. This form can be used if another plan has not already been prepared. Contact OSU Environmental Health & Safety for more information 737-2505.

Isolation Requirements

General: All construction, maintenance, and remodeling activities, regardless of size or scope, must be fenced, barricaded, or otherwise isolated to restrict entrance and to ensure the safety of those in the general area.

Outdoor Activities: Outdoor projects require the following perimeter isolation:

- A six foot chain-link fence, with controlled access points, extending in all directions around the excavation or building site such that no area of the construction is accessible to pedestrians or unauthorized personnel or vehicles.
- Isolation area will include vehicle loading and unloading areas.
- At the University's option, other barricading plans may be accepted. These may apply to projects such as road resurfacing, parking lot striping, exterior building water proofing, deliveries, etc. Contact EH&S regarding other barricading plans.

Overnight: Any excavation across or adjacent to sidewalks or pathways which must be left open overnight, must be identified with working, blinking construction lights in addition to solid barricades

Indoor Activities: Indoor construction or maintenance projects which will create dust, potentially hazardous fumes or vapors, or offensive odors are subject to the following isolation:

- Areas where existing doors can provide isolation will be labeled "Construction Area--Authorized Personnel Only".
- All other areas will be isolated by a solid barrier. The minimum barrier allowed is 4 mil poly sheeting sealed to prevent migration of dust.
- Mechanical ventilation may be required.
- A solid wall is required if building envelope is opened to the outside.

Contractor Responsibilities

- The contractor will provide all barricading, isolation, and fencing material. OSU will not provide any materials.
- The contractor will also provide all appropriate warning and detour signs when sidewalks, exits, or roads are closed.
- Contractor will provide all other construction area signs.

OSU Construction and Maintenance Safety Form

Send completed safety documents to Construction Contract Administration with contract and bonds.

Date: _____ Project: _____

Start Date: _____ Completion date: _____

Contractor: _____ Contact: _____

Work # _____ 24 hr #: _____

OSU Project Mgr: _____ Work / 24hr #'s: _____

Dept Contact: _____ OSU EH&S Contact: _____

Preconstruction meeting? **Y N** Date/Time/Location: _____

For the following items, prepare answers on a separate sheet for all items marked "Yes". Precede each answer with the appropriate item number. All boxes need to be checked

Y	N	For This Project	If YES, then:
		1 Will any confined spaces be accessed?	Describe location of entry Specify location of permit Notify EH&S prior to entry See SAF 209
		2 Will hot work be performed (welding, cutting, brazing, etc.)?	Provide min. 5# 2A10BC extinguisher within 10 ft If indoors - provide and describe ventilation See SAF 214
		3 Any products brought to campus?	Provide MSDS on site prior to first use; Make available to OSU on request
		4 Will lead paint be impacted?	Describe plan to limit contamination
		5 Will asbestos-containing-material be impacted?	Coordinate with OSU asbestos manager
		6 Will <u>any</u> materials (construction debris, soil, water, etc) be removed from campus?	Describe in detail identity and disposition of material (how, where)
		7 Any open trenches or holes?	Describe isolation procedures (see Page 1)
		8 Will a crane be used?	Describe crane safety plan (include plan to prevent loads above occupied areas)
		9 Is this project building a new facility, a major remodel?	Provide Site Safety plan Describe isolation procedures (see Page 1)
		10 Is this a minor remodeling project?	Provide, or fill out model Site Safety Plan form (see Page 3) Describe isolation procedures (see Page 1)
		11 Will air contamination be produced (e.g. dust, CO, solvent vapors, VOCs, odors)?	Describe project ventilation and isolation Indicate position of building air intake(s)

	12 Will there be noise > 85 dB?	Describe noise minimization plan
	13 Will this project use a scaffold or an external chute?	Describe isolation, dust control, installation
	14 Will this project involve a working surface >6' above a lower level	Describe fall protection
	15 Will any "blind" saw-cuts or penetrations be made in existing foundations, floors, ceilings and/or walls?	Describe plan for detecting and protecting power lines or other building utility lines.

EH&S Review: _____ Date: _____

Model Site Safety Plan

1. General Information

Contractor name _____

Address _____

City, State, Zip _____

Site Safety Officer _____ Project Dates _____

Project Name _____

2. Emergency Information

Emergency Response	911	OSU EH&S and OSU Facilities Services must be notified in the event of an emergency
Hazardous Materials Spill		
MSDS on-site location		
OSU EH&S	(541) 737-2273	
Facilities Services	(541) 737-2969	

3. Contractor Key Personnel

	Name	Phone	Emergency Contact
Company Owner			
Project Manager			
Job Supervisor			
Site Safety Officer			
Other Responsible Individual			
24 Hour Notification			

List of employees on site _____

4. Hazard Evaluation/ Facility Impact	
Physical	Yes / No
Heavy Equipment	
Noise	
Heat	
Elevation	
Radiation Materials	
Excavations	
Underground Utilities	
Confined Spaces	
Fire Prevention	
Electrical	

5. Emergencies
Services
Evacuation Route
First Aid Location
Hazardous Materials Spill Procedure

6. Work Zones

Material Storage _____

Parking locations _____

Individuals with OSU keys _____

Access issues _____

7. Security measures _____

8. Fire protection _____

SECTION 01 56 39

TREE AND PLANTING PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section includes temporary fencing, barricades, and guards to protect trees, plants and groundcovers not indicated to be removed, as necessary and required to prevent damage above and below grade.

1.02 DEFINITIONS

- A. Dripline: Outer perimeter of branches of any tree or plant.
- B. Groundcover: Includes but not limited to plants and grass.

1.03 PERFORMANCE REQUIREMENTS

- A. The Contractor shall exercise utmost care to protect existing trees and plants designated to remain and shall comply with all protection requirements provided by Owner and City of Corvallis as conveyed through the Owner's Authorized Representative.
- B. The Contractor shall install tree protection fencing as detailed and shall prevent damage to shrubs, groundcover, trees, root systems, soil, bark, foliage, branches and limbs due to construction activities, including but not limited to:
 - 1. Soil contamination, erosion, and compaction.
 - 2. Excessive wetting, and ponding due to storm water, and construction run-off.
 - 3. Alteration of grade, stockpiling of soil, debris, and materials.
 - 4. Damage to soil, roots, bark, trunk, limbs, branches, and foliage.
 - 5. Prevent unauthorized cutting, breaking, skinning and bruising of roots, branches, and bark.

1.04 SUBMITTALS

- A. Procedural proposal for tree and plant protection, describe methods of protection, and stabilization, provide drawings and supporting documentation as directed.
- B. Contractor's Condition Inspection; include written report and color photographs.

1.05 PROJECT CONDITIONS

- A. Install protection during initial mobilization at the Work site, and maintain until substantial completion.
- B. If, in the opinion of the Owner's arborist, additional protection is required, the Contractor shall install additional fencing as directed and without cost to the Owner.
- C. The location and requirements for additional fencing shall be determined by the

Owner's arborist prior to, and at any time during the course of the Work.

- D. Fencing:
 - 1. Fencing shall be installed at the tree and plant protection areas as detailed on Plans, or as directed by the Owner's Authorized Representative.
 - 2. Tree and plant protection fences shall remain in place until all Work is completed and shall not be removed or relocated without the approval of the Owner's Authorized Representative.
- E. Driving and Parking:
 - 1. Not permitted off paved surfaces without the approval of the Owner's Authorized Representative.
 - 2. When approved, the Contractor shall place plywood of sufficient thickness and width to support vehicles and prevent rutting on the area to be driven on.
 - 3. Care shall also be taken with respect to existing lawn sprinkler systems.
- F. Storage of materials and Debris: Not permitted off paved surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURED COMPONENTS

- A. Chain Link Fencing: 11 gage galvanized chain link, six feet. tall, and 1.5 inch inside diameter galvanized steel line posts and 2.5 inch inside diameter corner posts, provide lockable gates as necessary.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Inspect trees, plants, and groundcovers, document existing conditions prior to installation of protection.

3.02 EXECUTION

- A. Pruning and Cutting of Branches and Foliage:
 - 1. Review conditions with Architect or Owner prior to need for work and proceed as directed.
 - 2. All pruning to be done by Owner's landscape maintenance personnel or ISA Certified arborist under the direction of Owner's Landscape Management Department.
 - 3. Perform pruning and cutting with sharp instruments intended for the purpose; do not break or chop.
- B. Tree Protection:
 - 1. Provide temporary fence complying with Section 01 51 00 for protection of trees to remain.

2. Extend fencing ten feet beyond dripline, except where greater distance is required for protection of Elm trees.
3. Prevent entry into protected areas except as authorized in writing by the Owner's Authorized Representative.

3.03 REPAIR AND REPLACEMENT OF TREES AND PLANTS

- A. Repair trees or shrubs damaged by construction operations as directed by the Owner.
- B. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.
- C. Damaged Trees, Shrubs and Groundcover:
 1. Replace where Owner's Authorized Representative determines restoration to normal growth pattern is not possible; plant and maintain as directed.
 2. Replacement trees up to 13 inches caliper and shrubs up to 4 feet tall: Same size as damaged tree or shrub, species selected by the Owner's Authorized Representative.
 3. Trees over 13 inch caliper and shrubs greater than 4 feet tall: Compensate Owner as determined by an acceptable consulting arborist registered with the American Society of Consulting Arborists.
 4. Replacement groundcovers: Same size and quality as damaged species selected by Owner's Authorized Representative.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Summary:
 - 1. Product options.
 - 2. Product delivery, storage and handling.

1.02 PRODUCTS

- A. Products:
 - 1. New material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
 - 2. Products may also include existing materials or components specifically identified for reuse.
- B. Use interchangeable components of the same manufacture for similar components.
- C. Unless otherwise specified, all material and equipment shall be new; free from defects impairing strength, durability, and appearance; of current manufacture.
- D. Items specified shall be considered minimum as to quality, function, capacity, and suitability for application intended.
- E. Items incorporated into the Work shall conform to applicable specifications and standards designated, and shall be of size, make, type, and quality specified.
- F. Design, fabricate, and assemble in accordance with current best engineering, industry, and shop practices.
- G. Manufacture like parts of duplicate units to standard size and gauge to make them interchangeable.
- H. Two or more items of the same kind shall be identical and made by the same manufacturer.

1.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- C. Products Specified by Naming One or More Manufacturers: Products of manufacturers

named and meeting specifications, no options or substitutions allowed.

D. Substitution Procedure: Under Section 01 25 00.

1.04 REUSE OF EXISTING PRODUCTS

- A. Except as specifically indicated or specified, materials and equipment removed from existing construction shall not be used in the completed Work.
- B. For material and equipment specifically indicated or specified to be reused in the Work:
 - 1. Use care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
 - 2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration, or renovation.
 - 3. Remove and reinstall mechanical units, vents, guys, antennae, and electrical and grounding wires or conduits.

1.05 OWNER FURNISHED PRODUCTS

- A. Designate delivery dates of Owner-furnished items in the construction schedule.
- B. Receive, unload, store and handle Owner-furnished items at the site; protect from damage.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store and protect products in accordance with manufacturer's instructions.
- B. Arrange deliveries in accordance with construction schedules; coordinate to avoid conflict with Work and site conditions.
- C. Deliver and store products in undamaged condition in manufacturer's original containers or packaging with identifying labels intact and legible.
- D. Inspect shipments to assure compliance with Contract Documents and reviewed submittals, and that products are undamaged.
- E. Prevent soiling or damage to products or packaging.
- F. Interior Storage: Maintain required temperature and humidity ranges. Verify that Owner furnished storage meets product manufacturer's requirements.
- G. Exterior Storage:
 - 1. Store materials above ground to prevent soiling and/or moisture infiltration.
 - 2. Cover materials with waterproof breathable sheet coverings; provide adequate ventilation.
 - 3. All storage locations to be approved in advance by the Owner.
- H. Arrange storage to provide access for inspection.

- I. Coordinate with Owner's Authorized Representative all on-site storage activities.
- J. Provide for security of stored products.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED SECTIONS

- A. Section 01 25 00, Product Substitution Procedures.
- B. Section 01 33 23, Shop Drawings, Product Data, Samples

1.03 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of the Work.
 - 2. Efficiency, maintenance, or safety of any operational element.
 - 3. Visual qualities of sight exposed elements.
 - 4. Work of Owner or separate contractor.
- B. Include in request:
 - 1. Identification of project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work, and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Primary Products: Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution under provisions of Section 01 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect existing conditions prior to commencing Work, including elements subject to

damage or movement during cutting and patching.

- B. After uncovering existing work, inspect conditions affecting performance of Work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work.
- B. Provide devices and methods to protect other portions of the Work from damage.
- C. Provide protection from elements for areas which may be exposed by uncovering work.

3.03 CUTTING AND PATCHING

- A. Execute cutting, fitting and patching to complete work.
- B. Fit products together, to integrate with other work.
- C. Remove and replace defective or non-conforming work.
- D. Provide openings in the work for penetration of mechanical and electrical work.

3.04 PERFORMANCE

- A. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- B. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval from Owner's Authorized Representative.
- C. Restore work with new products in accordance with requirements of Contract Documents.
- D. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with approved fire rated material, to full thickness of the penetrated element.
- E. Refinishing:
 - 1. Refinish surfaces to match adjacent finish.
 - 2. For continuous surfaces, refinish to nearest intersection or natural break.
 - 3. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Related requirements specified elsewhere, cleaning for specific products or work: Specification section for that work.
- B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
- C. At completion of Work remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 QUALITY ASSURANCE

- A. Standards: Maintain project in accord with applicable safety and insurance standards.
- B. Hazard Control:
 - 1. Store volatile wastes in covered metal containers.
 - 2. Provide adequate ventilation during use of volatile or noxious substances.

1.03 MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

1.04 DURING CONSTRUCTION:

- A. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- B. At reasonable intervals during progress of Work clean site and public properties, and dispose of waste materials, debris and rubbish.
- C. Provide on-site containers for collection of waste materials, debris and rubbish.
- D. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- E. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until project is ready for Substantial Completion or occupancy.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

1.05 FINAL CLEANING

- A. Employ experienced workers, or professional cleaners, for final cleaning.
- B. In preparation for Substantial Completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, and other foreign materials from exposed interior and exterior finished surfaces.
- D. Remove putty, paint, labels, lubricants, etc., from windows, mirrors, and sash, and then polish, taking care not to scratch glass.
- E. Vacuum carpeting (shampoo where required), removing debris and excess nap.
- F. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- G. Replace air filters where units were operated during construction.
- H. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.

1.02 DEFINITIONS

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

1.03 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

1.04 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan to Owner and Architect within 7 days of date established for Notice to Proceed commencement of Work.

1.05 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. include the following information:

1. Material category.
 2. Generation point of waste.
 3. Total quantity of waste in tons.
 4. Quantity of waste salvaged, both estimated and actual in tons.
 5. Quantity of waste recycled, both estimated and actual in tons.
 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that 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.
- H. Refrigerant Recovery: Comply with requirements in Section 024119 - Selective Demolition for refrigerant recovery submittals.
- I. Subcontractor Education Plan: Prepare and distribute a document to inform subcontractors of the general process and purpose of pulling recyclable and reclaimable materials out of the waste stream. Encourage improvement at regular intervals.
- 1.06 QUALITY ASSURANCE
- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.
- B. Refrigerant Recovery Technician Qualifications: Universal certified by EPA-approved certification program.
- C. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 024119 "Selective Demolition."

- D. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- E. Waste Management Meetings: Conduct meeting at Project site with subcontractors. Review methods and procedures related to waste management including the following:
 - 1. Review and discuss waste management plan including responsibilities of each entity and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.
 - 6. Review status and progress of Waste Management at least bi-monthly with subcontractors to ensure process and goals are clear and targets are being met.

1.07 WASTE MANAGEMENT PLAN

- A. Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
 - 1. Visit dump sites to review how waste is processed to improve site collection to assist with proper and efficient disposal.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in Project, describe methods for preparing salvaged materials before incorporation into Work in compliance with Section 024119 - Selective Demolition, Salvage, and Protection.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by Work. Practice efficient waste management in use of materials in course of Work. Use reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:
 - a. Plywood and oriented strand board.
 - b. Wood paneling.
 - c. Wood trim.
 - d. Structural and miscellaneous steel.
 - e. Rough hardware.
 - f. Roofing.
 - g. Insulation.
 - h. Doors and frames.
 - i. Door hardware.
 - j. Windows.
 - k. Glazing.
 - l. Metal studs.
 - m. Gypsum board.
 - n. Acoustical tile and panels.
 - o. Equipment.
 - p. Piping.
 - q. Supports and hangers.
 - r. Valves.
 - s. Mechanical equipment.
 - t. Refrigerants.
 - u. Electrical conduit.
 - v. Copper wiring.
 - w. Lighting fixtures.
 - x. Lamps.
 - y. Ballasts.
 - z. Electrical devices.
2. Construction Waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Gypsum board.
 - i. Electrical conduit.

- j. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.

- k. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.

PART 3 - EXECUTION

3.01 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 entire duration of Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 015100 - Temporary Facilities and Controls.

- B. Training: Train workers, Subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin Work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 - 2. Comply with Section 015100 - Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.

3.02 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 024119 - Selective Demolition for salvaging demolition waste.
- B. 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.
- 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. Lighting Fixtures: Separate lamps by type and protect from breakage.
- F. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

- a. Inspect containers and bins for contamination and remove contaminated materials if found.
3. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
5. Store components off ground and protect from weather.
6. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.04 RECYCLING DEMOLITION WASTE

- A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- B. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- D. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- E. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- F. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- G. Conduit: Reduce conduit to straight lengths and store by material and size.
- H. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.05 RECYCLING CONSTRUCTION WASTE

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

B. Wood Materials:

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

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

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

D. Paint: Seal containers and store by type.

3.06 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, 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. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 DESCRIPTION

- A. The requirements specified in this section relate to all Contractors individually performing under these Contract Documents:
 - 1. Project Record Documents.
 - 2. Final review and payment.
- B. Related work specified elsewhere:
 - 1. OSU General Conditions.
 - 2. Shop Drawings, Product Data and Samples, Section 01 33 23.

1.02 PROJECT RECORD DOCUMENTS

- A. The Project Record Documents shall be organized to include the following information, as applicable:
 - 1. Table of Contents
 - 2. Project Team List
 - 3. Specifications (Including Addenda and Change Orders)
 - 4. Drawings
 - 5. Inspection Reports
 - 6. Signed Warranty(ies)
 - 7. Maintenance Instructions
- B. Draft Project Record Documents shall be submitted for review upon 75% completion of the Work.
- C. Project Record Documents shall be submitted electronically to the Owner. Hard copies will not be accepted.
- D. The project team list shall include the name, address, and phone number of the Owner, Contractor, Inspector, Subcontractors, and the materials manufacturers.
- E. Legibly mark each Specification section to indicate actual as-built condition indicating changes in the Work made by addenda or change order or actual materials used and actual manufacturer(s) used.
- F. Maintain current and accurate as-built mark-ups during construction and make available to Owner's Authorized Representative upon request.
- G. Legibly mark the drawings to indicate actual as-built conditions indicating changes in the Work made by addenda or change order or actual conditions which differ from the drawings.

- H. Redraw or provide new drawings as required for a complete as-built set of drawings. The Contractor shall maintain current and accurate as-built mark-ups during construction and make available to Owner's Authorized Representative.
- I. Include inspection reports if applicable.
- J. Include, in a single section, all copies of the Project's labor and material warranties clearly marked to identify the Owner's responsibilities under the terms of each warranty and the section of Work that each warranty covers. One set must be clearly marked as containing original documents.
- K. In the case of an elevator installation, the Contractor's and manufacturer's warranty shall provide for the Owner's right to respond to emergency/car failure situations for the purpose of extricating individuals trapped in the elevator.
- L. Include maintenance instructions complete with technical information and name, address, and phone number of the Contractor(s) and manufacturer(s) of each material and product.

1.03 FINAL REVIEW AND PAYMENT

- A. Prior to completion, the Contractor shall inspect the Work and make a Punch-list noting all items that are incomplete and/or incorrect.
- B. The Contractor shall notify all Subcontractors in writing of incomplete and/or incorrect items. Notify far enough in advance of the completion date that the Work can be completed on schedule. Said Work shall be immediately corrected.
- C. Should conditions prevail which prohibit some elements of the Work from being accomplished, but the work-in-place will perform the primary function (i.e., painting cannot be completed due to high moisture content of masonry walls.) the Contractor shall record the reason with this Punch-list item requesting temporary delay in completion from the Owner in writing.
- D. Notify the Owner in writing that all items are completed and ready for final review or else that the Work product is fully usable, but some listed deficiencies remain to be completed. Submit all record documents at this time.
- E. The Owner will review all documents. When the documents include a Contractor's request for delay in completion, the Owner will review all Work which is certified as complete to the best knowledge of the Contractor. The Owner will also review the listed incomplete Work and assign a value to such uncompleted work.
- F. The Contractor shall make the required corrections to the Work expeditiously. A letter will be addressed to the Contractor informing the Contractor of the project status.
- G. When Contract closeout procedures are completed and all Punch-list deficiencies have been corrected, provide Owner with final corrected Project Record Documents based on Owner's preliminary review. Correct Project Record Documents shall be in

electronic format.

- H. Final Completion by the Owner will be documented and the Contractor will receive written notice of acceptance of the Work and notification that final payment may be billed and released.
- I. All warranties shall commence and become effective beginning on the date of Substantial Completion.

END OF SECTION

SECTION 019113 – GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section describes work associated with commissioning of selected systems including commissioning meetings, construction checks, equipment start-up, functional testing, operations and maintenance manuals, and operator training.
- B. Work Provided Under Separate Contract: Owner's Commissioning Provider (CxP) will supervise commissioning activities and provide the following commissioning services:
 - 1. Develop commissioning plan.
 - 2. Assist Contractor to incorporate commissioning activities into Project Construction Schedule.
 - 3. Conduct commissioning meetings.
 - 4. Review project submittals.
 - 5. Develop Construction Checklists and Functional Test Plans.
 - 6. Observe Construction checks and start-up of selected equipment.
 - 7. Supervise and document functional testing.
 - 8. Review O&M manuals and as-built documents.
 - 9. Coordinate operator training.
 - 10. Prepare final commissioning report.
- C. Contractor shall provide the following services:
 - 1. Assign individuals representing Contractor and mechanical, electrical, controls, and low-voltage subcontractors as members of Commissioning Team.
 - 2. Incorporate commissioning activities in Contractor's construction schedule.
 - 3. Assist CxP in development of Construction Checklists.
 - 4. Execute Construction Checklists.
 - 5. Perform Equipment Start-up.
 - 6. Perform contractor-directed verification of automatic controls. and provide required verification documentation.
 - 7. Assist CxP in development of Functional Test Plans.
 - 8. Assist CxP with Functional Testing.
 - 9. Provide Operations and Maintenance documentation.
 - 10. Perform operator training and supervise training performed by manufacturer's representative.
 - 11. Provide submittals, product data, shop drawings, controls sequences, points list, wiring diagrams, schematics, and design documents to assist in commissioning documentation development.
- D. Contractor shall provide related services as directed, including, but not limited to:
 - 1. Access to the Work
 - 2. Incidental labor, facilities, and equipment to assist CxP in conducting commissioning activities.
 - 3. Completion of required submittals.

4. Coordination of Work with activities of CxP.

1.02 RELATED SECTIONS

- A. 01 91 13 – General Commissioning
- B. 23 08 00 – Commissioning of HVAC
- C. 26 08 00 – Commissioning of Electrical

1.03 DEFINITIONS

- A. CxP: Commissioning Provider (CxP) is the Individual responsible for supervising commissioning work.
- B. Construction Phase Commissioning Plan: Document prepared by the CxP that guides commissioning work through construction, verification, and warranty periods. The plan will include a listing of commissioning team members, systems to be commissioned, narrative description of the commissioning tasks and responsibilities, and a draft copy of the commissioning forms to be executed by the Contractor.
- C. Construction Phase: Phase of the project during which the facility is constructed and equipment is installed and started. During the Construction Phase, the Contractor completes construction checklists, performs equipment start-up, performs TAB work, submits O&M manuals, and performs control system verification. The Construction Phase generally ends at Substantial Completion.
- D. Verification Phase: Phase of the project during which functional testing and operator training is performed. The Verification Phase generally begins at Substantial Completion and ends at Final Completion.
- E. Online Commissioning System: The CxP will maintain an online commissioning system, which serves as a central location for accessing commissioning documents such as the Owner's Project Requirements, Commissioning Plan, status reports, design reviews, submittal reviews, schedules, and Issues Log. The online system provides current project information to authorized project team members through general internet access. The site URL is <https://www.swecx.com>. The Issues Log portion of the site allows for the Owner's Construction Manager, Architect, and General Contractor to provide comments, document actions, and indicate resolutions.

1.04 SUBMITTALS

- A. Designated Commissioning Team Representatives: Submit list of names and contact information for individuals representing Contractor and Subcontractor as members of Commissioning Team.
- B. Construction Schedule: Submit updated project construction schedule to CxP monthly. Incorporate time and duration of Commissioning activities, as provided by CxP, into the construction schedule

- C. Construction Submittals and Shop Drawings: Provide as required to perform commissioning work.
 - 1. Contractor to provide CxP a copy of the submittal log. CxP will review the log and identify submittals that are associated with equipment and systems being commissioned and required to be submitted to the CxP.
 - 2. Contractor to provide an electronic copy of each submittal or shop drawing to the Owner's Representative, including all resubmissions, required by the CxP at the same time submittals are provided to the Design Team. CxP will review submittals concurrently with the Design Team and provide review comments to the Design Team. The Design Team will consolidate review comments into a single submittal review response to be provided to the Contractor.
 - 3. Contractor to provide a copy of Design Team submittal review comments to the CxP.
 - D. Engineering Data: Provide shop drawings, product data, performance data, engineering data, installation and start-up data, operation and maintenance information, schematics, wiring diagrams, programming manuals, and similar information as necessary for completion of the Work of the Section in accordance with Commissioning Schedule.
 - E. Construction Checklists: Complete and submit to CxP for certification. Attach copies of all manufacturers' field or factory performance and start-up test documentation provided for associated equipment or systems.
 - F. Control Verification Reports: The Contractor shall provide complete Control Verification Reports to the CxP.
 - 1. Complete reports developed by CxP and submit to CxP for certification.
 - 2. Contractor to provide the CxP with sample point-to-point verification forms that the Contractor will use during initial start-up and verification of systems. The CxP will review the forms and provide comments as necessary to the Contractor.
 - G. Systems Ready to Balance Checklist: Complete and submit to CxP to demonstrate that systems are ready to be balanced.
 - H. Operator Training Schedule: Contractor shall submit training schedule listing all required training sessions as specified and in accordance with Training Plans. Training schedule shall include date and time of training, location, and name and qualification of trainer, and facilities needed for training. Training Schedule to be submitted to Owner's Authorized Representative four weeks prior to substantial completion.
 - I. Operations and Maintenance Manuals: Furnish a copy of draft and final Operations and Maintenance Manuals for review by CxP. CxP will provide review comments to the Commissioning Team upon completion of CxP review.
- 1.05 QUALITY ASSURANCE
- A. Provide qualified mechanics and technicians to provide required commissioning services. Technicians shall have knowledge of the Work and experience with installation and operation of the general systems and components involved to assist in commissioning activities. Individuals shall be adequately equipped to effectively assist the CxP as necessary. Upon request, submit names and qualifications of technicians to CxP for approval.

- B. Provide qualified instructors to perform operator training. Instructor shall be knowledgeable in the specific equipment and systems involved. Upon request submit names and qualifications of technicians to CxP for approval.

1.06 SEQUENCING

- A. Schedule adequate time as determined by CxP for execution of Commissioning Plan.
- B. CxP will conduct a Commissioning Process Meeting approximately 30 days after Contractor received Notice-to-Proceed and after all subcontractors are identified.
- C. CxP will prepare a Construction Phase Commissioning Plan approximately 30 days after Commissioning Process Meeting.
- D. Provide construction submittals and shop drawings to CxP as described above in SUBMITTALS.
- E. Provide engineering data as required by CxP to prepare Construction Checklists within four weeks after date of approved submittal.
- F. CxP will conduct an initial commissioning coordination meeting approximately 30 days before equipment begins to arrive at the project site to coordinate commissioning activities and execution of construction checklists. Additional commissioning coordination meetings will be scheduled as necessary throughout the process to discuss commissioning schedule and coordination among trades.
- G. Perform Construction Checks as equipment is received, installed, and placed in operation. Construction checks shall be performed as work is completed. For example, equipment inspection shall be performed upon receipt of equipment on site, installation inspection shall be performed when equipment is set in place and anchored, and so on.
- H. Submit schedule for operator training to Owner's Authorized Representative and CxP four weeks prior to Substantial Completion. Schedule shall include time and duration of each required training session.
- I. Submit control verification reports three weeks after Substantial Completion.
- J. Functional testing will be scheduled after construction checklists; testing, adjusting, and balancing report; and control verification reports have been submitted and accepted. Contractor shall provide written notice that systems are completely operational and ready for functional testing. Functional testing may proceed prior to acceptance if the CxP and Owner's Authorized Representative determines that deficiencies will not significantly affect system performance and timing is critical. The CxP will provide notification to Contractor, Architect, and Owner's Authorized Representative a minimum of one week prior to performing functional testing.
- K. Submit draft operations and maintenance manuals to Owner's Authorized Representative 30 days prior to substantial completion.
- L. Operator training shall be performed within a 30-day period following Substantial Completion. Training shall be executed by Contractor in accordance with manufacturer's requirements and training plans provided by CxP.

- M. Troubleshooting, corrections, and retesting shall be completed within three months of Substantial Completion.

1.07 SYSTEMS TO BE COMMISSIONED

- A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the operation and maintenance personnel, is required in cooperation with the CxP.
- B. The following systems will be commissioned as part of this project:
 - 1. Heating, ventilation and air-conditioning systems
 - a. Rooftop air handling units (new and existing)
 - b. Variable air volume (VAV) units
 - c. Electric unit heaters
 - d. Heat pump
 - e. Exhaust fans (existing)
 - f. Boiler
 - g. Building automation controls and interface to existing control devices
 - 2. Electrical systems
 - a. New roof lighting

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide specialized test equipment including manufacturer's proprietary test equipment, as necessary for commissioning of mechanical, electrical systems and components. Comply with requirements of individual technical Sections of Division 01, 23, 26. Common test equipment such as temperature, pressure, speed, and electrical power measuring devices shall be provided by CxP.

PART 3 - EXECUTION

3.02 APPLICATION

- A. Commissioning Meetings: Commissioning Team shall attend meetings as required by CxP including Commissioning Process Meeting, submittal review meetings, and coordination meetings prior to construction checks; adjusting and balancing; and functional testing. Commissioning team shall attend troubleshooting meetings as required to resolve issues identified in submittal reviews and commissioning reports.
- B. Construction Checklists:

1. Provide equipment installation, start-up, and operating information requested by the CxP as required to develop Construction checklists.
 2. Perform construction checks for all equipment being commissioned as described in Construction Checklists prior to equipment start-up. The Contractor shall designate responsibility for completing construction checks among subcontractors. The designated subcontractor shall initial and date each item on checkout sheets as completed and submit executed forms to CxP for certification. All items listed in the Construction Checklists shall be complete prior to certification unless the incomplete item does not affect safe and reliable equipment operation. If such an item is identified, a description of the incomplete work must be attached to the Construction Checklists. Equipment requiring construction checkout shall not be started until the Construction Checklists are fully executed by the Contractor.
 3. Contractor shall maintain "Cx Submittal Status Report." CxP will furnish Excel status report spreadsheet that will be used to monitor completion of construction checklists.
 4. Contractor shall startup equipment as described in construction checklists. Where required, provide manufacturer's agent to perform start-up as specified in Divisions 01, 23, 26.
 5. Fully executed Construction Checklists shall be submitted to the CxP for certification.
 6. CxP will document unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
 7. CxP shall perform a recheck of selected equipment. If minor discrepancies are identified, Contractor shall recheck all similar systems and resubmit Construction Check forms for certification. If major discrepancies are identified, CxP shall perform Construction Checks, and Contractor shall compensate Owner for additional commissioning costs by Contract modification
- C. Control Verification Reports:
1. Perform control system verification and prepare verification reports as specified in Divisions 01, 23, 26 Verification shall be performed by manufacturer's authorized installation contractor. Verification report shall include a description of the incomplete work.
 2. Submit completed Control Verification Reports to the CxP for acceptance.
 3. CxP will document unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
- D. Functional Tests:
1. Assist CxP in performing Functional Tests, which shall generally include operating equipment and systems as necessary for testing. The CxP will record test measurements and documentation of results.
 2. CxP will document all unresolved issues in a project Issues Log. The Issues Log documents status, responsibility, and required action for each unresolved issue.
 3. CxP shall retest selected systems once to verify that corrective work is complete. Retests will be performed after notification from the Contractor that work is complete. If corrective work is not complete and additional retesting is required, Contractor shall compensate Owner for costs of additional CxP testing sessions by Contract modification.
- E. Operations & Maintenance Manuals: Contractor shall provide complete operation and maintenance information for all equipment and systems being commissioned. Information shall be suitably bound, organized, and comprehensive. CxP will review and provide written review comments to the Owner's Authorized Representative.

- F. Operator Training: Contractor shall instruct Owner's operating personnel in operation and maintenance of mechanical and electrical equipment and all systems being commissioned.
1. Instruct Owner in proper operation and maintenance of equipment and systems. Instruction shall generally include topics listed in manufacturer's operations and maintenance manual. Operator instructions shall cover all aspects of manual, automatic, and safety controls. Contractor shall also instruct the Owner in the general configuration of systems and location of equipment and components. Equipment shall be fully operational prior to instruction.
 2. Contractor shall furnish training by equipment manufacturers where specifically required. Manufacturer's field start-up and adjustment will not fulfill manufacturer's training requirement and a separate site visit will be required to achieve training requirement.
 3. Contractor shall coordinate operator training with the Owner's Authorized Representative and CxP as follows:
 - a. Training Plan: The CxP shall develop an Operator Training Plan, which provides details regarding the type and amount of training required. The plan will include a Training Record and an Evaluation section to be executed at the completion of each training session. The Training Plan shall be executed by the Contractor and not the CxP.
 - b. Training Schedule: Contractor shall develop a training schedule for approval by the Owner's Authorized Representative.
 - c. Training Record and Evaluation Section: The Training Record and Evaluation section included on the Training Plan provide documentation of the attendees, duration, and quality of each training session. The Contractor shall complete Training Record after each training session. The Owner's Authorized Representative will complete the evaluation section of the Training Plan and the completed plan shall be returned to the CxP. Training will not be accepted until the Training Plan is returned to the CxP with the Record and Evaluation sections fully executed.
- G. Issues Resolution: Unresolved issues will be listed in the project online Issues Log. Refer to Online Commissioning System in Article 1.03, Definitions above. Each issue will be identified with an identification number. The Issues Log will include a description of the unresolved condition, identify the responsible individual(s), and describe suggested corrective action. The Contractor will periodically access the On-line Commissioning System to monitor the status of commissioning issues, and shall diligently complete all tasks that are identified as the responsibility of the Contractor. The Contractor shall modify on-line issue status when each item is completed and provide a description of corrective action performed. Contractor and related subcontractors shall attend commissioning meetings to review the Issues Log and coordinate resolution of issues as required by the CxP.

3.03 QUALITY CONTROL

- A. Provide mechanics that are experienced with the Work and installed components of each system to assist in completion of the commissioning activities.
1. Work necessary to provide systems complying with performance requirements of the contracts is the Contractor's responsibility.

- B. Manufacturer's Field Services: Provide manufacturer's representatives with expertise in components and systems. Where required, manufacturer's representative shall perform start-up, testing, and maintenance training of Owner's facilities staff including classroom and onsite instruction.

3.04 ACCESS TO WORK

- A. Contractor shall provide facilities and access for CxP to perform work including but not limited to:
 - 1. Keys, security passes, passwords, codes, etc.
 - 2. Ladders.
 - 3. Lifts where work is more than 12 feet above floor level.
 - 4. Removal of ceiling tiles, partitions, panels, or other fixed construction necessary for completion of work.
 - 5. Proprietary programming and metering equipment.

END OF SECTION 019113

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of the building or structure.
2. Salvage of existing items to be reused or recycled.

1.02 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.

1.03 MATERIALS OWNERSHIP

- A. OSU shall have the option of retaining ownership of existing equipment, materials, and items removed under the Work. Should OSU decide not to retain ownership of certain items removed under the Work, items shall become the property of the Contractor and demolition waste becomes property of Contractor and promptly removed from demolition site.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination Meetings: Conduct coordination meetings specifically for alteration Work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation meetings.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each specialist, supplier, Installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration Work activities shall be represented at these meetings. Participants at meeting shall be familiar with Project and authorized to conclude matters relating to alteration Work.
 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration Work. Include topics for discussion as appropriate to status of Project.
 - a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within Contract Time.
 - b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each entity present, including review items listed in "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
 - 1) Interface requirements of alteration Work with other Project Work.
 - 2) Status of submittals for alteration Work.
 - 3) Access to alteration Work locations.
 - 4) Effectiveness of fire-prevention plan.
 - 5) Quality and work standards of alteration Work.
 - 6) Change Orders for alteration Work.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
 4. Arrange selective demolition schedule so as not to interfere with Owner's operations.
- B. Preinstallation Meeting and Field Walk: Prior to start of Work conduct conference and field walk of area to be demolished with all team members including involved trades.
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 Fire-Protection Plan. Include the following:
 - a. Heat-generating equipment.
 - b. Fire-watch.
 - c. Fire-control devices, location and type.
 - d. Sprinkler systems.
 6. Review Drawings and scope/extent of demolition.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates 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. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.
- D. Schedule of Selective Demolition Activities: Indicate 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. Temporary interruption of utility services and extend of limited utility use.
 - 3. Shutoff and capping or re-routing of utility services.
 - 4. Coordination for shutoff, capping, and continuation of utility services.
 - 5. Use of lift and stairs.
 - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 7. Shoring.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 - Photographic Documentation. Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that 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.
- G. Fire Protection Plan: Develop plan that addresses use of heat-generating equipment and combustible materials and complies with authorities having jurisdiction and local codes.
 - 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
 - 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for immediate Work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- H. Inventory of Salvage Items: After removal or dismantling Work is complete, submit a list of items that have been salvaged.
 - 1. Acoustic Ceiling Tiles and suspension system
 - 2. Lighting fixtures
 - 3. HVAC diffusers and grilles.

4. Ceiling mounted equipment, where ceilings are replaced, including, but not limited to, speakers, fire alarm strobes, sensors, horns, security sensors, signage, etc.
5. Skylights.
6. Windows.
7. Face brick.

1.06 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous materials by landfill facility licensed to accept hazardous materials.
- C. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.07 QUALITY ASSURANCE

- A. Contractor Qualifications: Work shall be performed by skilled contractors having successful experience in comparable protection, salvage and removal operations including work on at least 3 projects similar in scope and scale to this Project in the last 5 years. Submit references with name of contact person and telephone number for the 3 submitted similar projects. Work to be performed by individuals whose qualifications have been submitted and approved.
- B. The subcontractors responsible for the repair or rehabilitation of salvaged elements shall also be responsible for the disassembly, cataloging, and storage of the same elements.
- C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.08 FIELD CONDITIONS

- A. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective or structure demolition.

- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of Work.
 - 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.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.09 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.
- B. Alteration Work Subschedule: A construction schedule coordinating sequencing and scheduling of alteration Work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration Work.
 - 1. Schedule construction operations in sequence required to obtain best Work results.
 - 2. Coordinate sequence of alteration Work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of existing building.
 - b. Owner's partial occupancy of completed Work.
 - c. Other known Work in progress.
 - d. Tests and inspections.
 - 3. Detail sequence of alteration Work, with start and end dates.
 - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 - 5. Use of elevator and stairs.
 - 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support imposed loadings without damage.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- B. Contractor and subcontractors performing demolition activities are to comply with lead paint regulations in OAR 437 Division 3, 1926.62.
 - 1. Untested painted or varnished surfaces throughout the building should be presumed to contain lead
- C. Standards: Comply with ASSE A10.6 and NFPA 241.

2.02 REPAIR MATERIALS

- A. Use repair materials identical to existing materials and as specified in Section as indicated on Drawings:
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.01 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. Determine whether removing any element might result in structural deficiency or unplanned operations
- D. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as Work progresses to detect hazards resulting from selective demolition activities.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video and templates.
 - 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.

3.02 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 Section 011100 - Summary of Work.

- 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. Arrange for Owner to shut off utilities.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductWork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductWork material and leave in place.
 - 4. Do not start demolition Work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

- B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish Work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015100 - Temporary Controls.
- C. Temporary Protection of Materials to Remain:
1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to existing surfaces except as indicated as part of alteration Work program.
- D. Remove temporary barricades and protections where hazards no longer exist.
- E. Existing Drains: Prior to start of Work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin Work in an area until drainage system is functioning properly.
1. Prevent solids such as adhesive or mortar residue or other debris from entering drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration Work.
 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Protection From Fire: Follow fire-prevention plan and requirements.

3.04 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 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 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 exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until Work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain fire watch at Project site during and until 60 minutes after conclusion of day's Work.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 - Construction Waste Management and Disposal.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
1. Clean salvaged items of dirt and demolition debris.
 2. Pack or crate items after cleaning; cushion against damage during handling. Label 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. Salvaged Materials for Reinstallation:
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. Storage: Catalog and store items within weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item for reinstallation with nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating identifying marks.
 2. Secure stored materials to protect from theft.
 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 degrees F or more above dew point.
- F. 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.
- 3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
- A. Masonry: Remove face brick in small sections and salvage as indicated on Drawings. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
1. Erect temporary bracing and supports as needed to prevent collapse of materials being removed.

2. Stop removal Work and immediately inform Architect if any structural elements above or adjacent to the Work show signs of distress or dislocation during any phase of removal Work.
- B. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075216 - SBS Modified Bituminous Membrane Roofing for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
 2. Remove existing roofing system down to substrate.
- C. Anchorages:
1. Remove anchorages associated with removed items.
 2. Dismantle anchorages associated with dismantled items.
 3. In non-historic surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new Work.

3.06 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. and recycle or dispose of them according to Section 017419 - Construction Waste Management and Disposal.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 - Construction Waste Management and Disposal.
- B. Do not burn demolished materials.

3.07 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.

3.08 SELECTIVE DEMOLITION SCHEDULE

- A. Remove and Reinstall, as indicated on Drawings:
1. Exterior lighting fixtures.
 2. Windows.
 3. Skylights.
 4. Bricks at parapet.
 5. Ceiling mounted equipment.

6. Acoustical ceiling tiles.

END OF SECTION

SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal of deteriorated concrete and subsequent replacement and patching at roof.

1.02 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 - Unit Prices.

1. Unit prices apply to authorized Work covered by estimated quantities.
2. Unit prices apply to authorized additions to and deletions from Work as authorized by Change Orders.

B. General: Unit prices include cost of preparing existing construction to receive Work indicated and costs of field quality control required for units of Work completed.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Conduct meeting at Project site.

1. Review methods and procedures related to concrete maintenance including the following:
 - a. Verify concrete-maintenance specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Coordination with building occupants.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For concrete-maintenance specialist and manufacturers.

- B. Material Certificates: For each type of portland cement and aggregate supplied for mixing or adding to products at Project site.
- C. Product Test Reports: For each product used in maintenance of concrete, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports.
- E. Quality-Control Program: Submit before Work begins.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer employ factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- B. Concrete-Maintenance Specialist Qualifications: Engage an experienced concrete-maintenance firm that employs installers and supervisors who are trained and approved by manufacturer to apply specified products and to perform Work of this Section. Firm to have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing or patching new concrete is insufficient experience for concrete-maintenance Work.
- C. Quality-Control Program: Prepare a written plan for concrete maintenance to systematically demonstrate ability of personnel to properly perform maintenance Work, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
- B. Store cementitious materials off ground, under cover, and in a dry location.
- C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.08 FIELD CONDITIONS

- A. Cold-Weather Requirements for Cementitious Materials: Comply with the following procedures:
 - 1. When air temperature is below 40 degree F., heat patching-material ingredients and existing concrete to produce temperatures between 40 and 90 degree F.
 - 2. When mean daily air temperature is between 25 and 40 degree F, cover completed Work with weather-resistant insulating blankets for 48 hours after repair or provide enclosure and heat to maintain temperatures above 32 degree F. within enclosure for 48 hours after repair.

3. When mean daily air temperature is below 25 degree F., provide enclosure and heat to maintain temperatures above 32 degree F. within enclosure for 48 hours after repair.
- B. Hot-Weather Requirements for Cementitious Materials: Protect repair Work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 degree F. and above.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: For repair products, obtain each color, grade, finish, type, and variety of product from single source and from single manufacturer with resources to provide products of consistent quality in appearance and physical properties.

2.02 BONDING AGENTS

- A. Latex Bonding Agent, Non-Redispersible: ASTM C1059.
1. Products: Provide one of the following:
 - a. MBCC Group: MasterEmaco A 660.
 - b. ChemMasters, Inc.: Cretelox.
 - c. Dayton Superior Corporation: Acrylic Bonding Agent J40.
 - d. Euclid Chemical Company (The): Akkro-7T.
 - e. Kaufman Products, Inc.: Surebond.
 - f. MAPEI Corporation: Planicrete AC.
 - g. Sika Corporation: SikaLatex.
 - h. US MIX Co: US Spec Acrylcoat.
 - i. W. R. Meadows, Inc.: Acry-Lok Bonding Agent.

2.03 PATCHING MORTAR

- A. Patching Mortar Requirements:
1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
- B. Cementitious Patching Mortar: Packaged, dry mix for repair of concrete.
1. Products: Provide one of the following:
 - a. MBCC Group: MasterEmaco N 220.
 - b. Dayton Superior Corporation: Recrete 20 Minute.
 - c. Euclid Chemical Company (The): Eucopatch.
 - d. Kaufman Products, Inc.: Patchwell Deep Light.
 - e. MAPEI Corporation: Planicrete AC.
 - f. Sika Corporation: SikaTop 122 Plus.

- g. US MIX Co.: US SPEC H2.
 - h. W. R. Meadows, Inc.: Euconcrete or Euconpatch.
2. Compressive Strength: Not less than 4,000 psi at 28 days when tested according to ASTM C109.

2.04 MISCELLANEOUS MATERIALS

- A. Portland Cement: ASTM C150 and C595, Type I, II, III or IL unless otherwise indicated.
- B. Water: Potable.

2.05 MIXES

- A. General: Mix products, in clean containers, according to manufacturer's written instructions.
 - 1. Do not add water, thinners, or additives unless recommended by manufacturer.
 - 2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
 - 3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

PART 3 - EXECUTION

3.01 CONCRETE MAINTENANCE

- A. Perform concrete-maintenance Work only by qualified concrete-maintenance specialist.
- B. Comply with manufacturers' written instructions for surface preparation and product application.

3.02 EXAMINATION

- A. Notify Owner and Architect 7 days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.
- B. Locate areas of deteriorated or delaminated concrete using hammer or chain-drag sounding and mark boundaries. Mark areas for removal by simplifying and squaring off boundaries. At columns and walls make boundaries level and plumb unless otherwise indicated.
- C. Perform surveys as Work progresses to detect hazards resulting from concrete-maintenance Work.

3.03 PREPARATION

- A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance Work begins and during its progress.
- B. Protect persons, motor vehicles, surrounding surfaces of building being repaired, building site, plants, and surrounding buildings from harm resulting from concrete maintenance Work.
 - 1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
 - 2. Use only proven protection methods appropriate to each area and surface being protected.
 - 3. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance Work.
 - 4. Contain dust and debris generated by concrete maintenance Work and prevent it from reaching public or adjacent surfaces.
 - 5. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
 - 6. Protect floors and other surfaces along haul routes from damage, wear, and staining.
 - 7. Provide supplemental sound-control treatment to isolate removal and dismantling Work from other areas of the building.
 - 8. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape or a liquid strippable masking agent. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
 - 9. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 - 10. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- C. Existing Drains: Prior to start of Work in an area, test drainage system to ensure that it is functioning properly. Notify Owner and Architect immediately of inadequate drainage or blockage. Do not begin Work in an area until drainage system is in working order.
 - 1. Prevent solids such as aggregate or mortar residue from entering drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance Work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- D. Preparation for Concrete Removal: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance Work. Examine adjacent Work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in course of repair.
 - 1. Verify that affected utilities have been disconnected and capped.
 - 2. Inventory and record condition of items to be removed for reinstallation or salvage.

3.04 CONCRETE REMOVAL

- A. Do not overload structural elements with debris.
- B. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
- C. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
- D. Remove additional concrete if necessary to provide a depth of removal of at least 1/2 inch over entire removal area.
- E. Where half or more of perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least 3/4 inch clearance around bar.
- F. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.
- G. Provide surfaces with a fractured profile of at least 1/8 inch that are approximately perpendicular or parallel to original concrete surfaces. At columns and walls, make top and bottom surfaces level unless otherwise directed.
- H. Thoroughly clean removal areas of loose concrete, dust, and debris.

3.05 BONDING AGENT APPLICATION

- A. Latex Bonding Agent, Type I: Apply to concrete by brush roller or spray. Allow to dry before placing patching mortar or concrete.

3.06 PATCHING MORTAR APPLICATION

- A. Place patching mortar as specified in this Article unless otherwise recommended in writing by manufacturer or where dry-pack mortar is indicated.
 - 1. Provide forms where necessary to confine patch to required shape.
 - 2. Wet substrate and forms thoroughly and then remove standing water.
- B. Pretreatment: Apply specified bonding agent .
- C. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
- D. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a smooth surface with a wood or sponge float.

- E. Curing: Wet-cure cementitious patching materials, including polymer-modified cementitious patching materials, for not less than 7 days by water-fog spray or water-saturated absorptive cover.

3.07 CONCRETE PLACEMENT

- A. Pretreatment: Apply latex bonding agent to concrete substrate.
- B. Wet-cure concrete for not less than 7 days by leaving forms in place or keeping surfaces continuously wet by water-fog spray or water-saturated absorptive cover.

3.08 FIELD QUALITY CONTROL

- A. Manufacturers Field Service: Engage manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance when requested by Architect.
 - 1. Have manufacturers' factory-authorized service representatives perform the following number of Project-site inspections to observe progress and quality of Work, distributed over period of product installation, regardless of on-site assistance requested by Architect:
 - a. Bonding-Agent and Packaged Patching-Mortar Installation: 3 inspections.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Hollow brick veneer.
2. Salvaged brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Flashing.
8. Miscellaneous masonry accessories.

B. Products Installed, But Not furnished, Under This Section:

1. Cavity wall insulation.

C. Related Requirements:

1. 024119 - Selective and Structure Demolition: Salvaged bricks.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct meeting at Project site.

1. Attendance: Owner, Architect, Contractor, and Installers and other entities directly affecting Work of this Section.
2. Time: Minimum of 3 weeks prior to starting Work of this Section.
3. Agenda: Address the following items at preinstallation meeting.
 - a. Structural concept.
 - b. Method and sequence of masonry construction.
 - c. Special masonry details.
 - d. Standard of workmanship.
 - e. Quality control requirements.
 - f. Job organization.
 - g. Other pertinent topics or issues.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product, including information on integral water repellent.

1. Thermal Masonry Ties: Provide data that thermal masonry ties comply with UL94.

- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

- C. Samples for Selection: For each type and color of the following:
 - 1. Hollow brick, in form of straps of 5 or more bricks.
 - 2. Pigmented Mortar: Make Samples using sand and mortar ingredients to match existing on Project.

- D. Samples for Verification: For each type and color of the following:
 - 1. Hollow brick, in form of straps of 5 or more bricks.
 - 2. Pigmented Mortar: Make Samples using same sand and mortar ingredients to be used on Project.
 - 3. Wicking material and cavity vents.
 - 4. Accessories embedded in masonry.

1.04 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

- B. Installer Qualifications: Submit evidence of compliance.

- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, per ASTM C1019, for grout mixes required to comply with compressive strength requirement.
 - 2. Include test reports for ASTM C780 for mortar aggregate mix ratios.

- D. 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 402/602.

- E. Material Certificates: For each type and size of the following:
 - 1. Masonry Units:
 - a. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - b. For exposed brick, include test report for efflorescence according to ASTM C67.

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. Anchors, ties, and metal accessories.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements stated in the Reinforced Concrete Masonry Construction Inspectors Handbook, most current version.
- G. Movement Joint Locations: Show joint sealant and precompressed foam secondary backup.
- H. Coordination Drawings showing interfacement of masonry with work of other Sections:
1. Structural connections, interfacements, and bearing.
 2. Openings, including for doors, windows, louvers and other architectural elements.
 3. Penetrations, including mechanical and electrical work.

1.05 QUALITY ASSURANCE

- A. Mockups: Build Partial Mockups per Section 014339 - Mockups to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Include cleaning procedures per TMS 602.
 - a. Dab undiluted cleaner on adjacent materials to test for adverse reactions; record reactions through photo documentation after 15 minutes.
 - b. Establish application pressure for pre-wetting, cleaner application and rinsing.
 2. Where masonry is to match existing, erect dry stack panels adjacent and parallel to existing surface for approval of match prior to building the integrated building Mock-up.
- B. Installer Qualifications:
1. Able to document not less than 5 years experience regularly engaged in performing commercial quality masonry work of comparable magnitude as Work of this Project.
 2. Certified member in good standing of the Washington State Conference of Mason Contractors (WSCMC) or accepted by Architect prior to Bid Date. Other Installers who meet or exceed Quality Assurance and Qualifications criteria of WSCMC may submit Bid following acceptance by Architect.
 3. Masonry Foreman:
 - a. Continuously in attendance and conducting supervision for duration of masonry work.
 - b. Able to document 5 years experience supervising and laying out masonry construction.
 4. Masonry Crew: Completed State approved journeyman apprenticeship training and able to demonstrate qualifications meeting or exceeding apprenticeship standards.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 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.
- B. Do not store sand directly on ground; provide a separation to protect from contaminates.
- 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 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 wall on edge at end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F. and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.
1. Shade aggregate and mixing area.
- F. Rainy-Weather: Work under covered area.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within 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.

2.02 PERFORMANCE CRITERIA

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 402/602.

2.03 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602 except as modified by requirements in 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 in referenced standard. Do not use units where defects will be exposed in completed Work.

2.04 BRICK UNITS, GENERAL

- A. Openings and Corners: Complying with ASTM C 216 and CSA A82, provide uncured and unfrogged solid brick units matching type, class, grade, color and texture of adjacent brick in the following locations:
 1. Corners: Inside and outside.

2. Openings: Including but not limited to windows, storefront, entrances and exits.
3. Lintels and sashes.
4. Sills and caps.
5. Applications that require a sawed exposed core edged to view.

2.05 BRICK VENEER (BV)

A. Hollow Brick (BR-1): Complying with ASTM C 652.

1. Basis of Design: Provide products by Mutual Materials or accepted equal to match existing:
 - a. Style: Match existing.
 - b. Grade: SW.
 - c. Type: FBX.
 - d. Class: H60V.
 - e. Construction Type: Anchored veneer.
 - f. Size (Nominal): 3 1/2 inches deep by 3 1/2 inches high by 11 1/2 inches long Economy size.
 - g. Color: Autumn Blend.
 - h. Texture: Smooth, match existing.
 - i. Type: Stocking.
 - j. Installation Pattern: Match existing..
 - k. Brick Orientation: Stretcher and Soldier top course where indicated on Drawings.
 - l. Performance Requirements:
 - 1) Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3,350 psi.
 - 2) Initial Rate of Absorption: Less than 30 g per 30 square inch per minute when tested per ASTM C67.
 - 3) Efflorescence: Provide brick that has been rated "not effloresced" when tested per ASTM C67.
 - m. Where shown to "match existing," provide clay face brick matching color range, texture, and size of existing adjacent brickwork.

2.06 SALVAGED BRICKS

A. Salvaged Bricks: See Section 024100 - Selective and Structure Demolition.

1. Salvaged brick should not be used unless mortar bond testing is performed:
 - a. Cull and discard damaged and broken brick.
 - b. Remove existing mortar, all dirt.
 - c. Clean 6 sides to ensure new mortar will bond to previously mortared brick surfaces.
 - d. Use only face brick units.

2.07 MORTAR AND GROUT MATERIALS

- A. 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.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: Not allowed.
- E. Mortar Cement: ASTM C91/C91M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 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. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
 - 2. Pigments shall not exceed 1 percent of masonry mortar by weight.
 - 3. Colors to match existing as selected by the Architect and confirmed by samples.
- G. Aggregate for Mortar: ASTM C404-11 and ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C, recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Provide one of the following or accepted equal:
 - a. Addiment Incorporated: Mortar Kick.
 - b. Euclid Chemical Company (The): Accelguard 80.
 - c. GCP Applied Technologies Inc.: Morset.

- I. Water: Potable.

2.08 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615 or ASTM A996, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and 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: Provide 1 of the following:
 - a. Heckmann Building Products Inc.: #376 Rebar Positioner.
 - b. Hohmann & Barnard, Inc.: #RB or #RB-Twin Rebar Positioner.
 - c. Wire-Bond: O-Ring or Double O-Ring Rebar Positioner.
- C. Masonry Joint Reinforcement, General: ASTM A951.
1. Exterior Walls: Stainless steel.
 2. Wire Size for Side Rods: 0.187 inch diameter.
 3. Wire Size for Cross Rods: 0.187 inch diameter.
 4. Wire Size for Veneer Ties: 0.187 inch diameter.
 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches on center.
 6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- D. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187 inch diameter, stainless-steel continuous wire.

2.09 TIES AND ANCHORS

- A. General: Extend ties and anchors at least 1 1/2 inches into masonry and halfway through veneer, with at least a 5/8 inch cover on outside face. Bend outer ends of wires 90 degrees and extend 2 inches parallel to face of veneer.
- B. Materials: Provide thermal ties and anchors specified in this Article that are made from materials that comply with the following unless otherwise indicated:
1. Stainless-Steel Wire: ASTM A580, Type 304.
 2. Stainless-Steel Bars: ASTM A276 or ASTM A666, Type 304.
- C. Individual Adjustable Thermal Wire Ties: Rectangular units with closed ends and not less than 4 inches wide fully-coated with a non-conductive material and integrated gasket.
1. Horizontal Spacing: Less than 16 inches on center, unless otherwise recommended in writing by manufacturer for project conditions.
 2. Wire:
 - a. Material: Stainless-steel.
 - b. Thickness: Fabricate from 3/16 inch diameter.

3. Vertical Adjustment: Not less than 3 1/2 inches.
 4. Non-Conductive Coating Flammability: Fully-coated, except for barrel and screw.
 - a. Flame Spread: UL 94 or ISO 9772.
 - b. Ignition Resistance: UL 746A.
 5. Integrated Gasket: Provide manufacturers standard integrated gasket to seal around air barrier.
 6. Masonry with Cells: Z-shaped ties with ends bent 90 degree to provide hooks not less than 2 inches long may be used for masonry constructed from hollow units laid with cells horizontal.
 7. Where wythe do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1 1/4 inches.
 8. Where distance between inside face of veneer and outside face of masonry backing exceeds 4 1/2 inches, provide wire ties that resist allowable load of not less than 50 pound-force load as designed by rational engineering analysis.
- D. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire stainless steel; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

2.10 FLEXIBLE FLASHING MATERIALS

- A. Flashing: As specified in Section 076200 - Sheet Metal Flashing and Trim.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 25 percent.
 1. Products: Provide the following:
 - a. Hohmann & Barnard, Inc.: Closed Cell Neoprene Sponge.
 - b. Williams Products Inc.: Williams Everlastic NN-1 1040 Series.
 - c. Wire-Bond: Expansion Joint.

2.12 MASONRY CLEANERS

- A. Masonry Cleaner: Commercial cleaning detergent and as instructed by manufacturer for brick taking surrounding conditions into consideration.
 1. See Section 041020 - Unit Masonry Cleaning.
 2. Muriatic acid cleaners not accepted.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride or antifreeze compound in mortar or grout.
 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for 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 C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. Type S: 1,800 psi; for exterior, above-grade, load-bearing and non-load-bearing walls, brick veneer, and parapet walls and for other applications where another type is not indicated.
- D. Mortar Material: Type S, mixed using a solution of 5 parts water and 1 part manufacturer's latex acrylic additive.
- E. Pigmented Mortar: Use a preblended mineral oxide pigmented cement product or select and proportion pigments with other ingredients to produce color required; make full batches only.
1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Pigments shall not exceed 5 percent of mortar cement by weight.
 3. Mix to match Architect's sample.
 4. Application: Use colored cement for exposed mortar joints with the following units:
 - a. Hollow brick.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- B. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- C. 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.
- D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from salvaged brick and several pallets or cubes as they are placed. Blend salvaged brick with new.
- E. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.03 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, 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, 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.
- C. Joints: Comply with TMS 602 Section 3.3.

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.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; 1/3 running bond bond pattern indicated on Drawings; do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with units in a wythe in running bond or bonded by lapping not less than 2 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 racking back units in each course from those in course below; do not tooth. When resuming Work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
 1. Retempering mortar not allowed.
- 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. 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 joint below and rod mortar or grout into core.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow clay brick as follows:
 1. With face shells in mortar and with head joints of depth equal to bed joints.
 2. With webs in mortar in all courses of piers, columns, and pilasters.
 3. With webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
 - 1. Tuck-point joints of rake scored units and tool with finish to match surrounding units.
- C. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, air barriers.

3.06 CAVITY WALLS

- A. Bond wythe of cavity walls together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than 1 metal tie for 2.67 square feet of wall area spaced not to exceed 24 inches on center horizontally and 16 inches on center vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches on center vertically.
 - a. Where bed joints of wythe do not align, use adjustable (2-piece) type ties.
 - b. Where one wythe is of clay masonry and other of concrete masonry, use adjustable (2-piece) type ties to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Apply air barrier to face of backup wythe to comply with Section 072500 - Weather Barriers.
- D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches on center both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit insulation between wall ties and other confining obstructions, with edges butted tightly. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.07 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to masonry backup with metal fasteners of type indicated. Use 2 fasteners unless anchor design only uses one fastener.
 - 2. Embed tie sections connector sections and continuous wire in masonry joints.

3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors not more than 18 inches on center vertically and 24 inches on center horizontally, with not less than one anchor for each 2 square feet of wall area. Install additional anchors within 12 inches of openings and at intervals not exceeding 8 inches, around perimeter.
- B. Provide airspace between back of masonry veneer and face of sheathing or insulation as shown on drawings.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.08 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 on center.
 2. Space reinforcement not more than 8 inches on center 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.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
1. PVC is not accepted.
 2. Rigid anchors may be used.
- D. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, pipe enclosures, and other special conditions.

3.09 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install 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 using one of the following methods:

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 3/8 inch for installation of sealant and backer rod specified in Section 079200 - Joint Sealants.

3.10 FLASHING AND CAVITY DRAINAGE

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and as indicated on Drawings; 16 inches to 24 inches on center.

3.11 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 Level 1 in TMS 402.
- C. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- D. Testing Prior to Construction: 1 set of tests.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, per ASTM C780.

3.12 CLEANING

- A. Protect adjacent materials and clean as required in TMS 602 in addition to requirements listed below:
 1. Clean within 5 to 7 days after brick installation.
 2. Do not attach construction supports to masonry walls.
 3. Wash or paddle off brick scum and mortar spills before they set.
 4. Cover walls during construction to mitigate staining.
 - a. Remove mortar stains from walls.
- B. Clean exposed masonry installed as part of the Work. Remove scaffolding and equipment. Dispose of debris, refuse, and surplus material off-site legally.
- C. Pre-Wetting: Pre-wet masonry per cleaning manufacturers recommendation and as established in Mockup; misting not accepted; flooding not accepted.
 1. Pre-wetting to be adjusted for time of day, temperature and sunlight exposure.

2. Use low pressure air spraying method with cold water.
 - a. Nozzle at least 25 degrees; 40 degrees preferred.
- D. Cleaning: Apply commercial cleaner at pressure as determined by Mockup in area large enough to rinse prior to product drying on surface.
 1. Hand scrubbing not accepted.
 2. Low pressure air sprayer nozzle at least 25 degrees; 40 degrees preferred.
 3. Do not allow cleaner to dry on substrate.
- E. Rinsing Cleaner: Rinse from top to bottom with low pressure air spraying method with wide tip nozzle at least 25 degrees; 40 degrees preferred.
 1. Rinse with pressure established through Mockup; less than 800 unless otherwise accepted by Architect.
- F. Reapply cleaner and rinse cycle as recommended by cleaner manufacturer to achieve substrate free of staining, pitting, efflorescence, calcite, lime run and white scum.
- G. Efflorescence: Correct on exposed surfaces with commercially prepared cleaning solution.
 1. Do not use muriatic acid as cleaning solution.
 2. Do not use sandblast cleaning equipment.
 3. Apply with low pressure air sprayer nozzle at least 25 degrees; 40 degrees preferred.
 4. Engage cleaner manufacturer to assess substrate if efflorescence persists when substrate dry to recommend alternate cleaner to address underlying issue.

3.13 PROTECTION

- A. Provide temporary protection for exposed masonry corners subject to damage.

3.14 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 tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as Work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave 1/2 of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with non-acidic cleaner applied according to manufacturer's written instructions.

3.15 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. Masonry Waste Recycling: Return broken masonry not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Standard structural steel.

1.02 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Erection Conference: Meeting to include Owner, Architect, manufacturer, and the steel erector's personnel supervising installation of buckling restrained braces to review installation procedures including handling, fit-up and fastening.
 - 1. Time: At least 3 weeks from commencement of Work.
 - 2. Review installation of anchorage items to be embedded in or attached to other construction without delaying the Work.
 - a. Review setting diagrams, sheet metal templates, instructions, and directions for installation.

1.04 ACTION SUBMITTALS

- A. Product Data:
 - 1. Structural-steel materials.
 - 2. High-strength, bolt-nut-washer assemblies.
 - 3. Threaded rods.
 - 4. Shop primer.
 - 5. Galvanized repair paint.
 - 6. Shrinkage-resistant grout.
 - 7. Filler.
- B. Shop Drawings: Show fabrication of structural-steel components.

1. Structural steel Shop Drawings shall contain sufficient detail and information to allow complete fabrication and erection of structure without reference to Contract Drawings either on fabrication shop floor or Project site. Steel detailer shall generate shop Drawings fabrication and installation details from Structural and Architectural Drawings and Specifications. Do not reproduce or use photocopies of Contract Drawings. When CAD or REVIT files are provided, it is detailer's responsibility to remove information not directly relevant information or references to outside sources in creation of Drawings:
 - a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - b. Include embedment Drawings.
 - c. 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.
 - d. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - e. Indicate weep holes for HSS and vent holes for galvanized HSS.
 - f. Identify members not to be shop primed.

- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:
 1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand-critical welds.

- 1.05 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For fabricator.
 - 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 materials, including chemical and physical properties.
 - E. Product Test Reports: For the following:
 1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 4. Shop primers.
 5. Nonshrink grout.
 - F. Survey of existing conditions.
 - G. Source quality-control reports.
 - H. Field quality-control reports.

1.06 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 experienced in erecting exposed aesthetic structural steel similar to that indicated in Specifications.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.07 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 F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
 - 2. ANSI/AISC 341.
 - 3. ANSI/AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - 1. Connection designs have been completed and connections indicated on Drawings.

2.02 STRUCTURAL-STEEL MATERIAL

- A. Recycled Content: Specified steel shall have recycled content with a minimum of 50 percent recycled content.
- B. W-Shapes: Refer to Structural Drawings.
- C. Channels, Angles: Refer to Structural Drawings.
- D. Plate and Bar: Refer to Structural Drawings.
- E. Cold-Formed Hollow Structural Sections: Refer to Structural Drawings.
- F. Steel Pipe: Refer to Structural Drawings.
 - 1. Finish: Galvanized, except where indicated in Drawings to have Paint finish, then Cold Applied Zinc.
- G. Steel Castings: ASTM A216/A216M, Grade WCB, with supplementary requirement S11.
- H. Steel Forgings: ASTM A668/A668M.
- I. Welding Electrodes: Comply with AWS requirements.
 - 1. Welding electrodes shall have a minimum tensile strength of 70 ksi using AWS A5 classification test.
 - 2. Welding filler metals, as supplied by the manufacturer, shall meet the requirements for H16 (16 mL diffusible hydrogen per 100 grams deposited weld metal) as tested using the mercury or gas chromatograph method as specified in AWS A4.3, "Standard Methods for Determination of Diffusible Hydrogen Content of Martensitic, Bainitic, and Ferritic Steel Weld Metal Produced by Arc Welding." Manufacturer's Certificate of Conformance shall be considered adequate proof that the supplied electrodes meet this requirement, and no additional testing of filler metal samples or of production welds is required.
 - 3. All low hydrogen electrodes shall be stored, handled, protected from atmospheric exposure and redried, if required, per AWS D1.1, 5.3.
 - 4. FCAW electrodes shall be received in moisture-resistant packages that are undamaged. They shall be protected against contamination and injury during shipment and storage. Electrode packages shall remain effectively sealed against moisture until the electrode is required for use. When removed from the protective packaging and installed on machines, care shall be taken to protect the electrodes and coatings, if present, from deterioration or damage. Modification or lubrication of an electrode after manufacture for any reason is not permitted, except drying shall be permitted when recommended by the manufacturer.

2.03 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain, Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
 - B. High-Strength A490 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 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
 - C. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 1. Finish: Hot-dip or mechanically deposited zinc coating.
 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.
 - D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 1. Finish: Plain.
 - E. Headed Anchor Rods: ASTM F 1554, Grade 55 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 hardened carbon steel.
 4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
 - F. 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.
 - G. Clevises and Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.
 - H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
 - I. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.
- 2.04 FILLER
- A. Polyester filler intended for use in repairing dents in automobile bodies.
- 2.05 THERMAL BREAK MATERIAL
- A. Description: Reduces heat transfer to mitigate condensation; low thermal conductivity and high compressive strength product. Provide thermal break at front side of bolt head between steel washer and face of exterior structural steel.

1. Basis of Design: Provide Armatherm Grade FRR by Armadillo Structural Connections or accepted equal:
 - a. Material: Reinforced thermoset resin.
 - b. Maximum Load Pressure: 45,000 psi.
 - c. Compressive Modulus: 1,450,000 psi.
 - d. Thickness: Refer to Structural Drawings.
 - e. Thermal Conductivity: Btu ft/ft²h degree F 0.103.
 - f. Accessories:
 - 1) Washer and Bushing: Provide Armatherm TM by Armadillo Structural Connections or accepted equal.
 - a) Bushing Bolt Size: As indicated on Drawings.
 - b) Washer Bolt Size: As recommended by manufacturer for application.

2.06 FABRICATION, STANDARD STRUCTURAL STEEL

- A. Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing 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. Re-Entrant Corners: Provide 1/2 inch radius at re-entrant corners, unless noted otherwise.
- C. 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.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Cleaning: Clean and prepare galvanized and ungalvanized steel surfaces to remain unpainted in accordance with SSPC-SP 2.
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning. Thermal cutting of holes is permitted with a surface roughness profile not exceeding 1,000 micro-inches as defined in ASME B46.1
 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.

2.07 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength 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 will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 2. Continuously seal joined members exposed to weather by continuous welds.
 - 3. Tack welds incorporated into the final weld and weld repairs of demand critical welds shall be of the same quality as the final welds, including preheat requirements. The filler metals shall be identical.
- C. Erection Connections, etc: Place holes, plates, or other attachments required by the Erector so as not to interfere with or cause other detrimental effect to structural members or their connections. Holes and attachments not permitted in the 'protected zone' as described in the Drawings.

2.08 FINISHING

- A. Cold-Applied Zinc Shop-Finish:
 - 1. Metal Preparation:
 - a. Pretreatment Chloride Test: Conduct a Bresle Patch Method per ISO 8502-6; pass with under 10¼g/cm squared.
 - 1) If test exceeds specified amount perform SSPC-SP -1 Solvent Cleaning.
 - b. Surface Roughness: Inspect for fins, edges, weld splatters or burning sag greater than 10 mm.
 - 1) File embossed imperfections to less than 10 mm surface difference.
 - 2. Blast Surface Cleaning: Comply with SSPC-SP-6 Commercial Blast Cleaning requirements.
 - 3. Post Treatment Testing:
 - a. Perform Surface Dust Test; comply with ISO 8502-3 at Level 2 or Level 1.
 - b. Surface Profile Measurement by Replica Tape, ASTM D4417 Method C: Comply with coating manufacturer written requirements for surface profile.
 - 4. Primer: Apply organic, aromatic urethane, zinc-rich primer.
 - a. Basis of Design: Provide Series 94-H20 by Thnemec or accepted equal:

- 1) Dry Film Thickness: Minimum 3 to 3.5 mils per coat.
 - 2) Galvanic Protection: Average measured potential of zinc primer 878 mille-volts.
 - 3) Adhesion: ASTM D4541 Type V positester; not less than 1,713 psi.
 - 4) VOC: Less than 89 g/L.
 - 5) Dry Zinc Content: At least 83 percent.
5. Intermediate Coat: Polyamide epoxy.
- a. Basis of Design: Provide Series 1095 by Tnemec or equal:
 - 1) Dry Film Thickness: 3 to 5 mils.
 - 2) VOC: Maximum 88 g/l.
 6. Site apply final 2 coats of High-Performance Topcoat; products as specified in Section 099000 - Painting and Coating.
- B. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to uncoated structural steel, nuts, bolts, and fasteners in accordance with ASTM A123/A123M.
1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Weep holes shall be provided at exterior closed sections where moisture may accumulate. Sizes shall be in accordance with ASTM A123.
 3. Galvanize lintels, shelf angles, and welded door frames attached to structural-steel frame and located in exterior walls.
 4. Materials for galvanizing shall be geometrically suitable for galvanizing as specified in ASTM A384 and A385. For built-up members, assemblies shall be fabricated as required to limit warping and distortion.
- C. Steel that will be finished by hot dip galvanizing shall have controlled silicon and phosphorus contents. The silicon content shall be in either of the ranges 0 to 0.04 percent or 0.15 percent to 0.25 percent, the phosphorus content shall be below 0.04 percent. Before galvanizing, submit mill test certificates verifying silicon and phosphorus contents to the Architect and galvanizer.
- D. Where welding required, weld to fullest possible extent prior to galvanizing.
- E. Bolts, nuts and washers, and iron and steel hardware components shall be galvanized by the hot-dip process in accordance with ASTM A153.
1. Surface Preparation: Steel shall be free of visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter: Clean steel in accordance with Steel Structures Painting Council SSPC-SP-6 Commercial Blast Cleaning.●

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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 on Drawings.
 - 1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates : 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 shrinkage-resistant 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 grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- 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. Slope roof framing members to slopes indicated on Drawings.
 - 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 on Structural Drawings.
- F. Do not use thermal cutting during erection unless approved by Architect. 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. Cutting and Fitting: No cutting of sections, either flanges, webs, stems or angles shall be done by the Contractor without the consent of the Engineer/Architect, unless this cutting is particularly specified or shown on the Drawings
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type 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 ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.05 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M Molten Zinc Repair.

3.06 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a 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.

3.07 FINISH SCHEDULE

- A. Finishes: Structural steel level attributes and zinc-coating as indicated; hidden from view structural steel not to receive high-performance coating.
 - 1. STL-1:
 - a. Zinc Application: Hot-dipped galvanized.
 - b. Edges: Ground smooth.

- c. Tolerance: One-half of standard fabrication tolerances.
- d. Visible Marks: Mill marks removed, no visible mill marks.
- e. Connections: Bolted, unless indicated otherwise on Drawings.
 - 1) Weld Appearance: Continuous, splatters removed.
- f. Finish Category: Category 1.
- g. Finish: As galvanized, quenching acceptable.

END OF SECTION

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Exterior non-load-bearing wall framing.
 2. Exterior mechanical enclosure.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate installation of Z shape framing enclosures that are anchored to or that receive other Work.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed 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.

- F. Evaluation Reports: For nonstandard cold-formed steel framing, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
- G. Delegated Design Submittal: For detail fabrication and assembly submittal for cold formed metal framing and design of seismic anchorage to comply with performance requirements and design criteria.
1. Show anchorage detail fabrication and attachment; Indicate quantity, diameter, and depth of penetration of anchors.

1.05 QUALITY ASSURANCE

- A. 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.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to product-certification program of Steel Stud Manufacturers Association.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, 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

2.01 MANUFACTURERS

- A. Basis of Design: Provide products by Monarch Metal Inc., or approved products from one of the following:

1. CEMCO; California Expanded Metals Co.
2. ClarkDietrich Building Systems, LLC.
3. Genesis Worldwide Inc.
4. SCAFCO Corporation.

2.02 PERFORMANCE CRITERIA

- A. Recycled Content: Specified steel shall have recycled content with a minimum of 50 percent recycled content.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 013573 - Delegated Design, to design cold formed metal framing and screen systems.
- C. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 1. Design Loads: As indicated on Drawings.
 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 1/600 of wall height.
 - b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of wall height.
 - c. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of wall height under a horizontal load of 5 lbf/square feet
 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 degree F.
 4. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- D. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 1. Wall Studs: AISI S211.
 2. Headers: AISI S212.
 3. Lateral Design: AISI S213.

2.03 COLD-FORMED STEEL FRAMING MATERIALS

- A. Recycled Content: Specified steel shall have recycled content with a minimum of 25 percent recycled content.
- B. Steel Sheet: ASTM A1003, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 1. Grade: ST33H or as required by structural performance.
 2. Coating: G60, A60, AZ50, or GF30.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - 2. Flange Width: As indicated on Drawings.

- 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 unless indicated otherwise.
 - 2. Flange Width: 1 1/4 inches unless indicated otherwise.

2.05 EXTERIOR NON-LOAD-BEARING MECHANICAL ENCLOSURE

- A. Steel Z Section: Manufacturer's standard hot dipped galvanized Z-shaped steel framing, of web depths indicated on Drawings, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - 2. Flange Width: As indicated on Drawings.

- B. Finishes for Enclosures: Shop applied to galvanized Z shapes, fasteners and exposed trim and framing.
 - 1. Prepare Galvanized components for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching SSPC-PC-1 cleaner as specified in Section 099000 - Painting and Coating.

- C. Pretreatment Cleaning, Etching, for Galvanized Metal: MPI #25.
 - 1. Products: Provide one of the following:
 - a. Cloverdale Paint: Cloverdale, ClovaClean, 78100.
 - b. Green Lakes Laboratories: Clean and Etch.
 - c. Rust-Oleum: Krud Kutter, Metal Clean and Etch, ME326 or ME014.
 - d. Sherwin Williams: Great Lakes Laboratories, Clean'n Etch, 899.
 - e. Approved substitution.

- D. Pre-Primer, Rust-Inhibitive, Water Based: MPI #134 (exterior).
 - 1. Products: Provide one of the following:
 - a. Benjamin Moore: Ultra Spec HP, Acrylic Metal Primer, HP04/FP04.
 - b. Sherwin Williams: Pro Industrial, Pro-Cryl Universal Primer, B66W1310.
 - 2. Application:
 - a. MPI #134: Water-based, anti-corrosive primer, interior and exterior for cleaned/ etched galvanized steel.

- E. Primer, Epoxy, Anti-Corrosive, for Metal: MPI #101.
 - 1. Products: Provide one of the following:
 - a. PPG Paints: Amerlock 2 AL, AK2-01A/ AK2-01B.
 - b. Rust-Oleum: 9300 System Epoxy Primer,
 - c. Sherwin Williams: Dura-Plate 235 Multi-Purpose Epoxy, B67W235.
 - 2. Application: Solvent based, 2-component, epoxy, anti-corrosive primer for interior and exterior ferrous and galvanized metals.

- F. Polyurethane, Two-Component, Pigmented, Semi-Gloss (Gloss Level 5): MPI #174.
 - 1. Products: Provide one of the following:
 - a. Benjamin Moore: Corotech, Aliphatic Acrylic Urethane Semi-Gloss, V510.
 - b. Sherwin Williams: Protective & Marine, Acrolon 218 HS Polyurethane Semi-Gloss, B65W651/B65V600.

2.06 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.07 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153, 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 design load, according to an evaluation report acceptable to authorities having jurisdiction, based on relevant CC-ES AC report as appropriate for substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: As appropriate for substrate.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.08 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780 or SSPC-Paint 20.

2.09 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding Work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than 3 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. Shop assemble mechanical enclosures to greatest extent possible. Clearly mark units for reassembly and installation. Use connections that maintain structural value of joined pieces.
- C. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- D. Tolerances for hidden elements: Fabricate assemblies level, plumb, and true to line to a maximum allowable 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.
- E. Tolerances for Exposed Enclosure Elements: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/16 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/32 inch from location indicated on Drawings. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to maximum out-of-square tolerance of 1/16 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Install sealer gaskets at underside of wall bottom track or rim track and at top of foundation wall or slab at stud locations.

3.03 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 1. Cut framing members by sawing or shearing; do not torch cut.
 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding Work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

- E. Install framing members in 1-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 - Thermal Insulation, in framing-assembly members, such as headers, sills, and multiple studs at openings, that are inaccessible on completion of framing Work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated on approved Shop Drawings
- 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. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Connect vertical deflection clips to studs 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.
- 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.

3.05 EXTERIOR NON-LOAD-BEARING ENCLOSURE INSTALLATION

- A. Finishing Galvanized Steel Enclosure, Opaque:
 - 1. Water-Based Light Industrial Coating System: Exterior miscellaneous galvanized metals, prepared to receive coatings.

- a. Pretreatment: Cleaner, etching for galvanized metal, MPI #25.
 - b. Pre-primer Coat: Primer, Rust-inhibitive, water-based MPI #134.
 - c. Primer: Epoxy, Anti-Corrosive, for Metal: MPI #101.
 - d. Intermediate Coat: Match topcoat.
 - e. Topcoat: Polyurethane, Two-Component, Pigmented, Semi-Gloss (Gloss Level 5): MPI #174.
- B. Fasten flanges to miscellaneous steel framing unless otherwise indicated on Drawings.
1. Spacing: As indicated on approved Shop Drawings.
- C. Set framing plumb.
- D. Install miscellaneous framing and connections, including clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable screen-framing system.
- 3.06 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.
- 3.07 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. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional Work with specified requirements.
- 3.08 REPAIRS AND PROTECTION
- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780 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

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel framing and supports for:
 - a. Mechanical and electrical equipment.
 - b. Rooftop Mechanical Screen Enclosures.
 - c. Applications where framing and supports are not specified in other Sections.
2. Metal ladders.
3. Metal ships' ladders and returns.
4. Loose bearing and leveling plates for applications where they are not specified in other Sections.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. 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.
2. 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.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

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. Steel framing for mechanical equipment enclosures.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Metal ladders.

5. Ladder safety cages.
6. Metal ships' ladders and pipe crossovers.

1.04 INFORMATIONAL SUBMITTALS

- A. Delegated Design Submittal: For seismic attachments, attachment to structure , including analysis data signed and sealed by qualified professional engineer licensed in the state of project responsible for their preparation.
 1. Show anchorage detail fabrication and attachment; indicate quantity, diameter, and depth of penetration of anchors.
- B. Qualification Data: For professional engineer.
- 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.

1.05 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."

1.06 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Recycled Content: Specified steel shall have recycled content with a minimum of 50 percent recycled content.
- B. Delegated Design: Engage a qualified professional engineer, to design railings, ladders and platforms, including attachment to building construction or metal ladder construction.
- C. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

- D. Structural Performance of Ladders: Ladders shall withstand effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Uniform Load: 100 lbf/square foot.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 square inch.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.

- E. 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 degree F., ambient; 180 degree F., material surfaces.

2.02 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

- B. Steel Plates, Shapes, and Bars: ASTM A36.

- C. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

- D. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

- E. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.

- F. Aluminum Castings: ASTM B26, Alloy 443.0-F.

- G. Aluminum: Provide alloy and temper recommended by aluminum producer for type of use indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bars and Shapes: ASTM B221, alloys as follows:
 - 2. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
 - 3. 6061-T1, for grating crossbars.

2.03 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.

- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; 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. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.
 - a. Acceptable Product: Kwik Bolt by Hilti or approved substitution.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

2.04 MISCELLANEOUS MATERIALS

- A. Cold Galvanizing Compound Over Steel: High-zinc-dust-content paint complying with SSPC-Paint 20 or ASTM A780, and is compatible with paints specified to be used over it.
 - 1. Products: Provide one of the following:
 - a. Alvin Products; a div. of Dampney Co., Inc.: Galvax.
 - b. Rust-Oleum: 7000 System Cold Galvanizing Compound.
 - c. ITW Professional Brands; LPS: Cold Galvanize Corrosion INHIBITOR.
 - d. ZRC Worldwide: Galvilite.
 - e. Approved substitution.
 - 2. Zinc Content: Minimum 93 percent by weight.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for interior and exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.05 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in 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.
- 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.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete 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.
- C. Galvanize miscellaneous framing and supports, unless noted otherwise.

2.07 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Occupational Safety and Health Administration (OSHA): Ladders to comply with standard 1926.1053 - Ladders.

C. Manufacturers: Provide products by one of the following:

1. O'Keeffe's Inc.
2. Precision Ladders, LLC.
3. Royalite Manufacturing, Inc.
4. Thompson Fabricating, LLC.

D. Fixed Access Ladder:

1. Basis of Design: Provide Access Ladders by O'Keefes Inc. or accepted equal:
 - a. Siderails: Continuous, 1/8 inch thick extruded-aluminum channels or tubes, not less than 3 inches wide; burr-free.
 - 1) Space siderails 24 inches apart unless otherwise indicated on Drawings.
 - b. Rungs: Extruded-aluminum square tubes, not less than 1 1/4 inch deep and not less than 1/8 inch thick, with serrated tread surfaces.
 - 1) Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - c. Load Capacity: Able to withstand at least 1,500 pounds.
 - d. Material: Aluminum; standard mill finish, as extruded.
 - e. Finish: Powder coated.
 - 1) Color: Custom color as selected by Architect. Color to match Metal Wall Panel.
 - f. Support each ladder at top and bottom and not more than 60 inches on center with welded or bolted aluminum brackets.
 - g. Accessories:
 - 1) Provide: Manufacturer's standard off-floor mounting and landing platforms indicated on Drawings.
 - 2) Provide: Manufacturer's standard telescoping ladder assist safety post at roof hatches.

E. Ship Ladder with Platform and Return:

1. Basis of Design: Provide Ship Ladders by O'Keefes Inc. or accepted substitution:

- a. Material: Corrosion-resistant aluminum.
- b. Angle: 60 degrees.
- c. Siderails: Continuous, 3/8 inch by 2 1/2 inch steel flat bars, with eased edges; not less than 1/4 inch material thickness.
- d. Treads shall be serrated and not less than 5 inches exclusive of nosing or less than 8 1/2 inches including the nosing, riser height shall be not more than 9 1/2 inches.
- e. Finish: Anodized, clear.
- f. Accessories: Provide manufacturer's standard seismic bracket; platform and returnAs indicated on Drawings.

F. Ladder Accessories:

1. Landing Platform: 1 1/2 inches or greater, tubular aluminum guardrails and serrated decks; serrated aluminum treads.
2. Seismic Bottom Support: 2 isolation bearings per stringer.
3. Safety Carrier: Fabricate carriers to comply with authorities having jurisdiction; welded; hoop spacing as determined by code.

2.08 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other Work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Hot-dip galvanize exterior miscellaneous steel trim.

2.09 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Finish: Hot-dip galvanize.

2.10 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.

2.11 STEEL FINISHES

- A. Cold-Applied Zinc: As specified in Section 051200 - Structural Steel Framing.
 - 1. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicate.
 - 2. Cold-apply zinc to elements scheduled to be painted.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel hardware and with ASTM A123 for other steel products.
 - 1. Galvanize elements scheduled not to be painted.

2.12 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.
- B. Powder-Coat Finish: AAMA 2605-17 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: Custom color as selected by Architect, .

PART 3 - EXECUTION

3.01 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. 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: 2 coats of clear lacquer.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

3.03 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.

3.04 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with zinc-rich primer/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. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.
- C. Damaged Shop Primed Ferrous Metal Surfaces: Reapply specified shop primer to make free of scratches and stains.
- D. Damaged Galvanized Surfaces to Receive Finish Coating: Touch up with specified inorganic, zinc rich, urethane primer.
- E. Damaged Galvanized Surfaces to remain Unfinished: Touch up with specified cold galvanizing compound.
- F. Site Welding: Clean and strip primed steel to bare metal where site welding is required and apply touch-up primer or cold galvanizing compound.

END OF SECTION

SECTION 055213 - PIPE RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel pipe railings.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. 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.
2. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Scheduling:

1. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

C. Preinstallation Meeting:

1. Location: Conduct conference at Project site.
2. Attendance: Owner, Architect, Contractor, and Installers and other entities directly affecting Work of this Section.
3. Time: Minimum of 2 weeks prior to starting Work of this Section.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.03 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include to-scale plans, elevations, sections, details, and attachments to other work.

- C. Samples: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.
 - b. Samples to set quality standards of Work.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer and testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless steel products certifying that products furnished comply with requirements.
- D. "Product Test Reports" Paragraph below may be used for verification of performance requirements if authorities having jurisdiction do not allow Contractor to provide engineering calculations.
- E. Evaluation Reports: For post-installed anchors, from ICC-ES.
- F. Delegated Design Submittal: For railing structure and seismic anchorage to building construction, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
 - 1. Show anchorage detail fabrication and attachment; Indicate quantity, diameter, and depth of penetration of anchors.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.07 FIELD CONDITIONS

- A. Field Measurements: Verify metal fabrication dimensions by field measuring existing or as-built construction prior to metal fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following:
 - 1. Steel Pipe Railings:
 - a. American Stair, Inc.
 - b. Ametco Manufacturing Corporation.
 - c. R&B Wagner, Inc.
 - d. VIVA Railings, LLC.
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.02 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer, to design railing structure, including attachment to building construction or metal stair construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 degree F., ambient; 180 degree F. material surfaces.

2.03 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Fittings: Match adjacent railing material and finish.

2.04 STEEL

- A. Recycled Content: Steel to have recycled content with a minimum of 75 percent recycled content.

- B. Steel Pipe for Railings: ASTM A53, Type F or Type S, Grade A, Standard Weight, unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations where indicated.
- C. Plates, Shapes, and Bars: ASTM A36.

2.05 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153 or ASTM F2329 for zinc coating.
 - 2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM 488, conducted by a qualified independent testing agency.
 - 1. Material for Exterior Locations: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.06 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.07 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form Work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with mechanical connections unless otherwise indicated on Drawings.
- H. Form Changes in Direction as Follows:
 - 1. Form rail-to-end post connections and changes in rail direction by radius bends, unless mitered corners are indicated.
 - 2. Form elbow and wall returns by bending or by inserting prefabricated elbow fittings.
- I. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- J. Close exposed ends of railing members with prefabricated end fittings.
- K. Flanges, Fittings, and Anchors: Provide wall flanges, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated. Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.08 STEEL FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123 for hot-dip galvanized railings.
 - 3. Comply with ASTM A153 for hot-dip galvanized hardware.

4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, fasteners, sleeves, and other ferrous components.
- C. Powder-Coat Finish: AAMA 2605 -17 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
1. Color and Gloss: Custom as selected by Architect from industry's full color line to match Architects sample..

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 [1/16] inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.02 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.03 ANCHORING POSTS, EXTERIOR

- A. Existing Features: Drill for fasteners and install plates, fasteners and posts per Drawings and fastener manufacturer's written instructions. Secure posts in place until fully cured.
- B. Connections between shop fabricated Sections of railings to be mechanically fastened as shown on Drawings. Field splices are highly discouraged.
 - 1. If field splices must be made, field weld and finish with zinc-rich primer.

3.04 ADJUSTING AND CLEANING

- A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780.

3.05 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

3.06 RAILING SCHEDULE

- A. Railing, Type 1: Galvanized finish, including attachments and accessories.
- B. Railing, Type 2: Powder Coat finish, including attachments and accessories.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Miscellaneous lumber.
 2. Rooftop equipment bases and support curbs.
 3. Concealed wood blocking and nailers.

1.02 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. WCLIB: West Coast Lumber Inspection Bureau.
 2. WWPA: Western Wood Products Association.

1.03 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 products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSB Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Post-installed anchors.

1.05 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

2.01 WOOD PRODUCTS, GENERAL

- A. 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.
- B. Maximum Moisture Content of Lumber: 15 percent for 2 inch nominal thickness or less, 19 percent for more than 2 inch nominal thickness unless otherwise indicated.
- C. Lumber fabricated from old growth timber is not permitted.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Categories:
1. UC3B for exterior construction not in contact with ground.
 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.03 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
- B. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
 - 1. Hem-fir or hem-fir (north); Standard or No. 3 Common grade; WCLIB or WWPA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other Work.

2.04 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, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating weight complying with ASTM A153.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, as appropriate for substrate, based on the following:
 - 1. Mechanical Anchors, Masonry: ICC-ES AC01.
 - 2. Mechanical Anchors, Concrete: ICC-ES AC58.
 - 3. Adhesive Anchors, Masonry: ICC-ES AC193.
 - 4. Adhesive Anchors, Concrete: ICC-ES AC308.
 - 5. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 - 6. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

- F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, load equal to 6 times load imposed when installed in unit masonry assemblies and equal to 4 times load imposed when installed in concrete as determined by testing per ASTM E488 conducted by qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.05 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. 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, and similar supports to comply with requirements for attaching other construction.
- B. 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.
- C. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use copper naphthenate for items not continuously protected from liquid water.
- D. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- E. Securely attach rough carpentry Work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES evaluation report for fastener.
- F. 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.

3.02 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.

3.03 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 enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Water-resistive barrier and air barrier gypsum sheathing.
2. Plywood sheathing.
3. Sheathing joint-and-penetration treatment materials.
4. Installation accessories.

1.02 REFERENCES

A. Definitions.

1. Air Barrier (AB): Air tight barrier made of material that is relatively air impermeable but moisture vapor permeable, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.
2. Water-Resistive Barrier (WRB): Water-shedding barrier made of material that is moisture-resistant, installed to shed water, with sealed joints and penetrations, and with terminations sealed to adjacent surfaces.
3. Rough Openings: Openings in the wall to accommodate windows and doors.
4. Material Transitions: Areas where the WRB / AB coated fiberglass-mat gypsum sheathing connects to beams, columns, slabs, parapets, foundation walls, roofing systems, and at the interface of dissimilar materials.

1.03 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. For weather and air barrier sheathing system, include manufacturer's technical data and tested physical and performance properties of products.

B. Shop Drawings:

1. Indicate locations and extent sheathing system, including details of typical conditions.
2. Special joint conditions.
3. Intersections with other building envelope systems and materials; head-of-wall, base-of-wall, control and expansion joints.
4. Counter flashings and details showing bridging of envelope at substrate changes including tie-ins to adjacent construction.
5. Details of sealing penetrations.
6. Details around windows and doors.

1.04 INFORMATIONAL SUBMITTALS

- A. Test Reports: Submit test reports indicating compliance with specified performance characteristics and requirements.
- B. Manufacturer's written instructions on substrate preparation recommendations, installation, and finishing.
- C. Fire Propagation Characteristics Certificate: From a qualified testing agency, documentation that air barrier system as a component of a wall assembly has been tested and passed NFPA 285. Include system classification number of testing agency on Shop Drawings.
- D. Sample Warranty: Submit a sample warranty identifying the terms and conditions of the warranty as herein specified
- E. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated plywood.

1.05 QUALITY ASSURANCE

- A. Mockups: Build Partial Mockup per Section 014339 - Mockups to demonstrate aesthetic effects, and to set quality standards for materials and execution.
- B. Manufacturer Qualifications: A qualified manufacturer experienced in manufacturing of sheathing assembly as one of its principal products.
- C. Installer Qualifications: An experienced Installer approved by factory applied sheathing assembly manufacturer and employing applicators trained in application of specified products.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packaging and store in an enclosed shelter providing protection from damage and exposure to the elements.
 1. Store within temperature limits required by manufacturer.
 2. Comply with manufacturer's written instructions for safety and handling.
- B. Store accessory materials in a location with constant ambient temperatures of 40 degree to 80 degree F.

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

1.07 FIELD CONDITIONS

- A. Cold Weather Conditions:
 - 1. Site Fluid-Applied, Vapor-Permeable Joint Flashing: Comply with manufacturer's cold weather application written instructions when atmospheric temperatures or substrate surface temperatures are less than 40 degree F.
 - 2. Accessories and Sealants: Comply with manufacturer's cold weather application instructions when atmospheric temperatures or substrate surface temperatures are less than 40 degree F.

1.08 WARRANTY

- A. Provide manufacturer's exposure warranty that offers 12 months of coverage against in-place exposure damage (delamination, deterioration) beginning with the date of installation of the product.
- B. Provide manufacturer's standard warranty for sheathing to be free of manufacturing defects that make it unsuitable for its intended use. Warranty period shall be 10 years from the date of purchase of the product.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Weather and Air Barrier Performance: Air and vapor-permeable barrier sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to exterior incidental condensation or water penetration. Barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations , tie-ins to installed waterproofing , tie-ins to other installed air barriers, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Factory mark panels to indicate compliance with applicable standard.

2.02 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.
- 2.03 WATER-RESISTIVE BARRIER AND AIR BARRIER GYPSUM SHEATHING (WRB-AB GYP)
- A. Description: Coated fiberglass mat gypsum sheathing with integral weather-resistant barrier and air barrier complying with applicable requirements of ICC-ES AC212, ASTM E 2178, ASTM E 2357, ASTM C 1177.
 1. Basis of Design: Provide DensElement Barrier System by Georgia-Pacific Gypsum, LLC or accepted equal:
 - a. Securock ExoAir 430 System by United States Gypsum Company:.
 2. Weight: 2.5 pound per square foot.
 3. Thickness: As indicated on Drawings.
 4. Panel Size: 48 by 96 inches for vertical installation.
 5. Compression Strength: minimum 500 psi.
 6. R-Value: 0.67.
 7. Vapor Permeability: ASTM E96 minimum 20 perms with sealed joints and fasteners.
 8. Moisture Absorption Rate: Less than 6 percent.
 9. Air Permeance: ASTM E 2178.
 - a. Sheathing: Less than 0.001 cfm per square foot.
 - b. Assembly: Less than 0.04 cfm per square foot.
 10. Fire Propagation Characteristics: NFPA 285 compliant.
 11. Surface-Burning Characteristics: Tested in accordance with ASTM E 84 test method; 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: 50 or less.
 12. Elongation: ASTM D412, minimum 200 percent.
 13. Combustion Characteristics; ASTM E 84: Class A.
 14. Panel Product Antifungal Properties: ASTM D 3273, 10; 0 defacement.
 15. VOC Content: 50 g/L or less.
 16. Ultraviolet and Weathering Resistance: Maximum 12-month exposure minimum.
 - B. Accessory Materials:
 1. Primer: Liquid primer recommended by manufacturer for substrates requiring field application of air-barrier materials and for sealing cut edges of sheathing.

2. Fluid Applied Flashing/ WRB/AB: Site applied synthetic polymer as recommended by manufacturer for sealing joints, penetrations, fasteners and around rough openings.
3. Material Transitions: As recommended by sheathing manufacturer for project conditions.

2.04 PLYWOOD SHEATHING

- A. Plywood Parapet Sheathing: DOC PS 1, Exposure 1, Structural I sheathing.
 1. Nominal Thickness: As indicated on Drawings, but not less than 7/16 inch.

2.05 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, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating weight complying with ASTM A153.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours per ASTM B117.
 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

2.06 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Water-Resistive Barrier and Air Barrier Gypsum Sheathing: Gaps to receive fluid-applied flashing shall be less than 1/4 inch.
 1. Gaps greater than 1/8 inch and less than 1/4 inch: Fill with backer rod prior to filling with fluid-applied flashing.
 2. Gaps greater than 1/4 inch: Comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Framing Examination: Examine framing to determine if work is ready to receive sheathing panels.
 1. Verify surface flatness tolerances and framing spacing comply with Project requirements.
 2. Proceed with work once conditions meet manufacturer's written recommendations.

- B. Adjacent Substrate Examination: Prior to installation of accessory materials, examine adjacent substrates to receive transition treatment.
 - 1. Verify substrates are sound, free of contaminants, adequately cured or aged, compatible with proposed transition materials, and free of obstructions or impediments that would result in failure of transition adhesion and failure of assembly to perform in accordance with Project requirements.
 - 2. Proceed with installation once conditions meet manufacturer's written recommendations and after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Coordinate sheathing panel installation with flashing, joint sealant, and air-barrier accessory material installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- C. Cut panels at penetrations, edges, and other obstructions of Work; fit tightly against abutting construction unless otherwise indicated.
- D. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- E. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.03 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.

3.04 WATER-RESISTIVE BARRIER AND AIR BARRIER GYPSUM SHEATHING INSTALLATION

- A. Comply with ASTM C 1280, GA-253, and manufacturer's written instructions.
- B. Remove projections, protruding fasteners, loose or damaged sheathing material at edges of panel that might interfere with proper installation to seal joints, corners, fasteners, penetrations, openings, or material transitions.
 - 1. Fill voids with substrate patching material.
- C. Clean, prepare, and treat portions of work not requiring factory fluid-applied weather-resistant and air barrier panel substrate in accordance with air-barrier manufacturer's written instructions.
 - 1. Mask adjacent finished surfaces.
 - 2. Remove contaminants and film-forming coatings from substrates.
- D. Prepare and treat joints and cracks in substrate per ASTM C 1193 and membrane air-barrier manufacturer's written instructions.
- E. Install sheathing panels with long dimension perpendicular or parallel to framing. Abut ends and edges of sheathing panels centered over face of framing members. Offset sheathing panel joints by not less than one stud spacing.
 - 1. Apply sheathing panels in pieces sized to provide minimum number of joints and optimum sheathing board arrangement. Arrange joints so that panels do not span between fewer than three support members.
 - 2. Do not bridge building expansion joints; cut and space edges of sheathing panels to match spacing of structural support elements.
- F. Do not cover sheathing panels until sealants and accessory trims have cured and tested by Owner's testing agency.
- G. Correct deficiencies in or remove sheathing panels that do not comply with requirements; repair substrates and reapply weather-resistant and air-barrier components.
- H. Rough Openings: Treat rough openings with sealant or accessory products according to manufacturer installation instructions.
- I. Flashings: Seal top of through-wall flashings to sheathing panels with continuous transition strips of type recommended by sheet air barrier manufacturer for type of flashing.
- J. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- K. Seal top of through-wall flashings to sheathing with an additional 6-inch wide, transition strip.
- L. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets per manufacturer's recommendation.

3.05 CLEANING

- A. Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.
- B. Clean spills, stains, and overspray resulting from application, utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.

3.06 PROTECTION

- A. Water-Resistive Barrier and Gypsum Sheathing: Protect sheathing panels from damage from subsequent work. Protect membrane materials from exposure to UV light for period in excess of that acceptable to membrane air-barrier manufacturer; Replace overexposed materials .

END OF SECTION

SECTION 070150.19 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Full tear-off of entire roof system.
 2. Removal of flashings and counterflashings.
 3. Temporary roofing.

1.02 UNIT PRICES

- A. Work of this Section is affected by concrete deck repair as specified in Section 012200 - Unit Prices.

1.03 DEFINITIONS

- A. Full Roof Tear-off: Removal of existing roofing system down to existing roof deck.
- B. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.04 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:
 - a. Reroofing preparation, including roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing roofing system components that are to remain.
 - c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
 - e. Existing roof deck conditions requiring Architect notification.
 - f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.

- g. Structural loading limitations of roof deck during reroofing.
- h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
- i. HVAC shutdown and sealing of air intakes.
- j. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- k. Asbestos removal and discovery of asbestos-containing materials.
- l. Governing regulations and requirements for insurance and certificates if applicable.
- m. Existing conditions that may require Architect notification before proceeding.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Temporary Roofing Submittal: Product data and description of temporary roofing system.
 - 1. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer stating acceptance of the temporary roof and that its inclusion does not adversely affect the new roofing system's resistance to fire and wind or specified special warranty.

1.06 INFORMATIONAL SUBMITTALS

- A. Field Test Reports:
 - 1. Fastener pull-out test report.
- B. Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.
 - 1. Submit before Work begins.
- C. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.07 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with governing EPA notification regulations before beginning roofing removal.
 - 2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.08 FIELD CONDITIONS

- A. Existing Roofing System: SBS-modified bituminous membraneroofing.
- B. Owner will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so Owner's operations are not disrupted.
 2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
 3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
 4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
 - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to the design roof live load (25psf) per the original existing design documents by SOM, Sheet S4, dated March 31, 1980.
- G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 1. Remove only as much roofing in one day as can be made watertight in the same day.
- H. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
 1. Hazardous materials will be removed by Owner before start of the Work.
 2. Existing roof will be left no less watertight than before removal.
 3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
 - a. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.01 TEMPORARY PROTECTION MATERIALS

- A. EPS Insulation: ASTM C 578.
- B. Plywood: DOC PS 1, Grade CD, Exposure 1.

2.02 TEMPORARY ROOFING MATERIALS

- A. Design and selection of materials for temporary roofing are Contractor's responsibilities.
- B. Base Sheet: ASTM D 4601/D 4601M, Type II, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet.
- C. Asphalt Primer: ASTM D 41/D 41M.
- D. Roofing Asphalt: ASTM D 312/D 312M, Type III or IV.

2.03 INFILL AND REPLACEMENT MATERIALS

- A. Use infill materials matching existing roofing system materials unless otherwise indicated.
 - 1. Infill materials are specified in Section 075216 - Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing unless otherwise indicated.
- B. Wood blocking, curbs, and nailers are specified in Section 061000 - Rough Carpentry.
- C. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

2.04 AUXILIARY REROOFING MATERIALS

- A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- B. Shut off rooftop utilities and service piping before beginning the Work.
- C. Test existing roof drains to verify that they are not blocked or restricted.
 - 1. Immediately notify Architect of any blockages or restrictions.
- D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
 - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

- E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
 - 1. Prevent debris from entering or blocking roof drains and conductors.
 - a. Use roof-drain plugs specifically designed for this purpose.
 - b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
 - a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.02 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for the following day and obtain authorization to proceed.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Full Roof Tear-off: Where indicated on Drawings, remove existing roofing and other roofing system components down to the existing roof deck.
 - 1. Remove substrate board vapor retarder roof insulation and cover board.
 - 2. Remove base flashings and counter flashings.
 - 3. Remove perimeter edge flashing and gravel stops.
 - 4. Remove copings.
 - 5. Remove expansion-joint covers.
 - 6. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
 - 7. Remove wood blocking, curbs, and nailers.
 - 8. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry, if acceptable to the manufacturer.
 - a. Remove unadhered bitumen, unadhered felts, and wet felts.
 - 9. Remove excess asphalt from steel deck.
 - a. A maximum of 15 lb/100 square foot of asphalt is permitted to remain on steel decks.
 - 10. Remove fasteners from deck or cut fasteners off slightly above deck surface.

3.03 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- D. Provide additional deck securement as indicated on Drawings.

3.04 INFILL MATERIALS INSTALLATION

- A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.
 - 1. Installation of wood blocking, curbs, and nailers is specified in Section 061000 - Rough Carpentry.
- B. Install new roofing patch over roof infill area.
 - 1. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.05 TEMPORARY ROOFING

- A. Install approved temporary roofing over area to be reroofed.
- B. Prepare temporary roof to receive new roofing according to approved temporary roofing proposal.
 - 1. Restore temporary roofing to watertight condition.
 - 2. Obtain approval for temporary roof substrate from roofing manufacturer and Architect before installing new roof.

3.06 BASE FLASHING REMOVAL

- A. Remove existing base flashings.
 - 1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain.

1. Replace metal counterflashings damaged during removal with counterflashings specified in Section 076200 - Sheet Metal Flashing and Trim.
- C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.
1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.
- D. When directed by Architect, replace parapet framing, wood blocking, curbs, and nailers to comply with Section 054000 - Cold-Formed Metal Framing. and Section 061000 - Rough Carpentry where not indicated elsewhere.
- 3.07 DISPOSAL
- A. Collect demolished materials and place in containers.
1. Promptly dispose of demolished materials.
 2. Do not allow demolished materials to accumulate on-site.
 3. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Mineral-wool board.
 - 3. Insulation attachment devices.
 - 4. Thermally-broken spacer system.

1.02 ACTION SUBMITTALS

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

1.03 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product providing compliance with identified testing standards per product, performed by a qualified testing agency.

1.04 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.

PART 2 - PRODUCTS

2.01 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I.
 - 1. Manufacturers: Provide products by one of the following:
 - a. CertainTeed Corporation: Sustainable Unfaced Fiberglas Building Insulation.
 - b. Johns Manville; a Berkshire Hathaway company: Formaldehyde-free Unfaced Fiberglass
 - c. Knauf Insulation: EcoBatt Insulation
 - d. Owens Corning: EcoTouch PINK Fiberglas Insulation.
 - e. Approved substitution.

2.02 MINERAL-WOOL SEMI RIGID BOARD

- A. Mineral-Wool Board, Unfaced: ASTM C612, Type IVA and IVB; passing ASTM E136 for combustion characteristics.
 - 1. Product: Provide one of the following:
 - a. Rockwool International: Cavity Rock.
 - b. Owens Corning: RainBarrier HD.
 - 2. R-Value: 4 per inch.
 - 3. Nominal Density: Minimum 6 lb per cubic foot.
 - 4. Moisture Resistance: Absorbs less than 1 percent by volume, ASTM C1104.
 - 5. Surface Burning Characteristics according to ASTM E84.
 - a. Maximum Flame Spread: 0.
 - b. Smoke Developed: 0.
 - 6. Combustibility: Non-combustible when tested according to ASTM E136.
 - 7. Thermal Resistivity: 4.3 hour foot square F/Btu at 75 degrees F.

2.03 THERMALLY-BROKEN SPACER SYSTEM

- A. Manufacturers: Provide products by one of the following:
 - 1. Advanced Architectural Products, LLC.
 - 2. Cascadia Windows and Doors.
 - 3. Engineered Assemblies, Inc.
 - 4. Knight Wall Systems, Inc.
- B. Sub-Framing Thermal Spacer Systems:
 - 1. Polyester and vinyl ester bioresin matrix with recycled materials, fire retardant additives and integral, continuous metal inserts the length of clip profile, internally-reinforced with glass fiber strands for longitudinal and transvers strength.
 - a. Basis of Design: Provide SMARTci GreenGirt Composite Framing Support (CFS) Clips by Advanced Architectural Products or equal from accepted manufacturers.
 - 1) Length: 6 inches.
 - 2. Depth: 3 inches, unless otherwise noted on Drawings.
 - 3. Spacing, Horizontally and Vertically: As recommended by manufacturer's installation requirement and as indicated on Drawings.
- C. Thermal Spacer Fasteners:
 - 1. Spacer Fasteners: High hex-head washer head with sharp twin lead threaded design of heat treated corrosion resistant coated steel.

- a. As recommended in writing by manufacturer for the application.
2. Lengths: As recommended by fastener manufacturer to meet pull out requirements for each type of substrate but no less than 1 1/2 inches.

2.04 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Spray Foam Sealant: Single component, closed cell, polyurethane foam for use at perimeter of window and door rough openings, sound-deadening of hollow metal frames, and where indicated.
 - a. Products: Provide one of the following:
 - 1) DAP Products, Inc.: Daptex Plus.
 - 2) Dow Chemical Company: Great Stuff Pro.
 - 3) Schul International Company, Inc.: Sealtite B, Type II.
 - 4) Soudal: Soudasil.
 - 5) WillsealUSA, LLC: Niversal Foam Sealant.
 - 6) Approved substitution.

2.05 REGULATORY REQUIREMENTS

A. Insulation Identification Mark:

1. An R-value identification mark shall be applied by manufacturer to each piece of building thermal envelope insulation 12 inches or greater in width.
2. Alternately, the insulation installers shall provide a certificate listing the type, manufacturer and R-value of insulation installed in each element of the building thermal envelope.
3. R-value shall be determined in accordance with US Federal Trade Commission R-value rule CFR Title 16, Part 460.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.02 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.

- B. Install insulation with identification mark readily observable during inspection.
- C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. 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.
- F. Use insulation support straps where indicated on Drawings and to supplement other attachment methods necessitated by Project conditions.

3.03 INSTALLATION OF CAVITY-WALL INSULATION

- A. Mineral-Wool Semi Rigid Insulation and Board Insulation: Install insulation board by securing fasteners in accordance with insulation manufacturer's written recommendations.

3.04 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Glass Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than 1 length is required to fill cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3 inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Spray Foam Sealant: Apply according to manufacturer's written instructions.

3.05 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Water-Resistive Air Barriers.
 - 2. Accessory materials

1.02 DEFINITION

- A. Water Resistive Barrier Assembly: A combination of building wrap and accessories that do the following:
 - 1. Prevents the accumulation of water as a water resistive barrier.
 - 2. Minimizes the air leakage into or out of the building envelope as a continuous sheet barrier.
 - 3. Provides sufficient water vapor transmission to enable drying as a vapor permeable membrane.
- B. Air-Barrier Assembly: The collection of sheet barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- C. Air-Barrier Material: A primary element that provides a continuous barrier to movement of air.
- D. Air-Barrier Accessory: A transitional component of the air-barrier and water resistive barrier assembly that provides continuity.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct meeting at Project site.
 - 1. Meeting Time: Schedule meeting a minimum of 4 weeks prior to beginning Work of this Section and related Work.
 - 2. Require attendance by Architect, Owner, Contractor, Installers, manufacturers representatives, and other parties directly affecting Work of this Section.
 - 3. Review air-barrier requirements and installation, special details, mockups, air-leakage testing, sheet barrier protection, and work scheduling that covers sheet barriers.

1.04 ACTION SUBMITTALS

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

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate, technical data; and tested physical and performance properties of products.
2. For building wrap, include data on air and water-vapor permeance based on testing per referenced standards.

B. Shop Drawings:

1. For Water-Resistive and Air Barrier Assemblies:
 - a. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - b. Included details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - c. Include details of interfaces with other materials that form part of the sheet barrier.

1.05 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Instructions: For installation of each product specified.
- B. Product Certificates: From manufacturer, certifying compatibility of sheet barrier and accessories materials with Project materials that connect to or that come in contact with sheet barrier.
- C. Product test reports: For each assembly, for test performed by a qualified testing agency.
- D. Manufacturer's written letter of verification for the compatibility of weather barrier, flexible flashing as specified in Section 076200 - Sheet Metal Flashing and Trim.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Maintain locally available representative to give technical assistance, attend meetings, and inspect installation for conformance to manufacturer's instructions.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
 2. Minimum 5 years of experience in performing installation of sheet barrier system as specified and able to document a list of projects with similar scope and complexity.
- C. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Partial Mockups: Build in-place Partial Mockups per Section 014339 - Mockups to demonstrate aesthetic effects, and to set quality standards for materials, execution and verification of testing requirements.

1.07 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing self adhered weather-resistive air barriers, field test their adhesion to Project substrates per ABAA, manufacturer's recommendations, and as follows:
1. Locate tests where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each kind of adhered sheet and substrate.
 3. Notify Architect 7 days in advance of dates and times when test locations will be created.
 4. Arrange for tests to take place with manufacturer's technical representative present.
 5. Report whether barrier failed to adhere to substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For barriers that fail adhesively, retest until satisfactory adhesion is obtained. Consult with manufacturer's representative for recommended material and substrate modifications
 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Barriers not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use barriers that fail to adhere to substrates during testing.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened container and packaging, with labels clearly identifying product name and manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Store materials in a clean dry area and protect stored materials from direct sunlight.
- D. Store at temperatures at or above 40 degrees F, free from contact with cold or frozen surfaces.
- E. Protect materials during handling and application to prevent damage or contamination.

1.09 FIELD CONDITIONS

- A. Environmental Limitations: Apply barriers within range of ambient and substrate temperatures recommended in writing by manufacturer.
1. Protect substrates from environmental conditions that affect performance.
 2. Do not apply sheet barrier to a damp or wet substrate or during snow, rain, fog, or mist

1.10 WARRANTY

- A. Manufacturer's Product Warranty: To repair or replace weather barrier product that fails in materials within specified warranty period.

1. The products have been tested in accordance with national standards for air and water-resistive barriers and passed those tests with effectiveness and durability indicating their suitability for performance as an air and water-resistive barrier system when properly applied.
2. That the products will not disintegrate and will maintain their integrity over the life of the warranty.
3. The products shall be free from defects.
4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Source Limitations: Obtain weather barrier primary materials and accessories from single source from single manufacturer.

2.02 PERFORMANCE CRITERIA

- A. Air-Barrier Assembly Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous sheet barrier and as a liquid-water drainage plane flashed to discharge to exterior incidental condensation or water penetration.
- B. 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.
 1. Air-Barrier Assembly Air Leakage Rate: Maximum 0.04 cfm/square feet under a pressure differential of 1.57 lb/square feet; ASTM E2357
- C. Air-Barrier Building Enclosure Air Leakage: Fan Test per Section 014150 - Air Barrier System Quality Control Testing Requirements.

2.03 WATER-RESISTIVE AIR BARRIER

- A. Self-Adhered Water-Resistive Air Barrier: Vapor-Permeable Nonbituminous Sheet, Minimum 20-mil-thick, self-adhering, spun-bonded polypropylene sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.
 1. Basis of Design: Provide WrapShield SA Self-Adhered Water-Resistive Vapor Permeable Air Barrier Sheet by VaproShield LLC or accepted equal from one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.: Fire Resist 705 VP.
 - b. GCP Applied Technologies Inc.: Perm-A-Barrier VPS.
 - c. Henry Company: Blueskin VP160.
 - d. Approved substitution.

2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/square feet of surface area at 1.57-lbf/square feet pressure difference; ASTM E2178.
 - b. Puncture Resistance: Minimum 40 lbf; ASTM E154.
 3. Vapor Permeance: Minimum 50 perms; ASTM E96, Water Method (Procedure B).
 - a. Adhesion to Substrate: Minimum 16 lbf/square inch when tested according to ASTM D4541 as modified by ABAA.
 - b. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - c. UV Resistance: Can be exposed to sunlight for 150 days according to manufacturer's written instructions.
 4. Ingredient Disclosure:
 - a. ILFI Declare Label LBC Red List Free.
 - b. ILFI Declare Label LBC Red List Approved.
- B. Material Ingredients: Current third-party verified chemical inventory of at least 1,000 ppm. Fluid Applied Water-Resistive Air Barrier: Vapor-Permeable Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
1. Basis of Design: Provide R-Guard CAT 5 by PROSOCO, Inc. or one of the following:
 - a. Carlisle Coatings & Waterproofing, Inc.: Barritech VP.
 - b. DuPont Building Innovations: Tyvek Fluid Applied WB/WB+.
 - c. GCP Applied Technologies Inc.: Perm-A-Barrier VPL 50.
 - d. Henry Co.: Air Bloc 17MR or Air Block All Weather STPE.
 - e. Sto Corp; Sto Gold Coat.
 - f. Tremco: ExoAir 230.
 - g. W.R. Meadows, Inc.: Air-Shield LMP.
 2. Solids Content: Minimum of 50 percent.
 3. Air Permeance: Maximum 0.004 cfm/square feet of surface area at 1.57 lbf/square feet pressure difference; ASTM E2178.
 4. Vapor Permeance: Minimum 10, maximum 25 perms; ASTM E96, Desiccant Method, Procedure A.
 5. Ultimate Elongation: Minimum 300 percent; ASTM D412, Die C.
 6. Adhesion to Substrate: Minimum 16 psi. when tested according to ASTM D4541.
 7. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 8. UV Resistance: Can be exposed to sunlight for a minimum of 180 days according to manufacturer's written instructions.
 9. VOC: Less than 45 grams per liter.
 10. Ingredient Disclosure:
 - a. ILFI Declare Label - LBC Red List Free.
 - b. ILFI Declare Label LBC Red List Approved.

- c. Material Ingredients: Current third-party verified chemical inventory of at least 1,000 ppm.

2.04 WEATHER BARRIER ACCESSORY MATERIALS

- A. Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by manufacturer to produce a complete assembly and that are compatible with primary material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Expansion Joint Bridge Material: Stainless-Steel Sheet: ASTM A240, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.
 1. Do not use as flashing material; flashing specified in Section 076200 - Sheet Metal Flashing and Trim.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of Work.
 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Not for use below-grade or in locations designed to be continuously immersed in water.

3.02 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
 1. Clean, prepare, treat and seal inside and outside corners, vertical and horizontal surfaces at terminations and penetrations and through fastener penetrations with termination mastic.

2. 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.
- B. Mask off adjoining surfaces not covered by sheet barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. 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 sheet barrier.
- G. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details
- H. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.
- I. Apply and firmly adhere air-barrier sheets over area to receive sheet barrier. Accurately align sheets and maintain uniform 2 1/2 inch minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
 1. Apply sheets in a shingled manner to shed water.
 2. Roll sheets firmly to enhance adhesion to substrate.
- J. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.
- K. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.
- L. Do not cover sheet barrier until it has been tested and inspected by testing agency.
- M. Correct deficiencies in or remove sheet barrier that does not comply with requirements; repair substrates and reapply air-barrier components.
- N. Field Adhesion Test: Perform at least 3 self-adhered barrier field adhesion tests for the first 1000 feet of installed barrier for each exterior self-adhered barrier type over each type of substrate.
 1. Subsequently perform 1 test for every 1000 feet or one test substrate.
 2. Performing 3 additional tests after a test fail.
 3. Coordinate Field Adhesion Test and Partial Mockup installations.
 4. Locations to be selected by Architect.

3.03 SHEET WATER-RESISTIVE AIR BARRIER INSTALLATION

A. Weather Limitations:

1. Do not apply to surface when air temperatures are below 40 degrees F. or above 110 degrees F; follow sheet barrier manufacturer's written recommendations.
2. Provide weather protection and temperature controls to maintain manufacturer's requirements; application in winter schedule, contractor to provide weather protection provisions such as tenting and heat as required. Obtain approval from manufacturer's representative.

B. Cover exposed exterior surface of sheathing with sheet barrier securely adhered immediately after sheathing installed.

C. Cover sheathing with sheet barrier as follows:

1. Cut back barrier 1/2 inch on each side of break in supporting members at expansion- or control-joint locations.
2. Apply sheet barrier to cover vertical flashing with a minimum 6 inch overlap unless otherwise recommended in writing by manufacturer.

D. Apply sheet barrier material to form seal with strips and transition strips to achieve continuous barrier according to barrier manufacturer's written instructions and details.

1. Provide moisture meter testing for substrate prior to application. Verify surface is within manufacturer's recommended moisture ranges.
2. Do not score overlapped sheets.
3. Do not stretch material during installation.
4. Install 6 inches overlap in each direction vertically for inside and outside corners.
5. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

E. CMU Assembly: Install air-barrier sheet horizontally against CMU beginning at base of wall. Align top edge of air-barrier sheet immediately below protruding masonry ties or joint reinforcement or ties, and firmly adhere in place.

1. Overlap horizontally adjacent sheets a minimum of 6 inches and roll seams.
2. Apply overlapping sheets with bottom edge slit to fit around masonry reinforcing or ties. Roll firmly into place.
3. Seal around masonry reinforcing or ties and penetrations with termination mastic.
4. Continue sheet into openings in walls, such as doors and windows, and terminate at points to maintain an airtight barrier that is not visible from interior.

3.04 FLUID-APPLIED WATER-RESISTIVE AIR BARRIER INSTALLATION

A. Weather Limitations:

1. Do not apply to surface when air temperatures are below 40 degrees F. or above 110 degrees F.

2. Provide weather protection and temperature controls to maintain manufacturer's requirements. Application in winter schedule, Contractor to provide weather protection provisions such as tenting and heat as required. Obtain approval from manufacturer's representative.
- B. Apply fluid-applied barrier material to form a seal with strips and transition strips and to achieve a continuous barrier according to manufacturer's written instructions and details. Apply fluid-applied barrier material within manufacturer's recommended application temperature ranges.
 1. Provide moisture meter testing for all substrates prior to application. Verify that surface is within manufacturer's recommended moisture ranges.
- C. Apply barrier material in full contact around protrusions such as masonry ties.
 1. Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, applied in 1 or more equal coats.

3.05 ACCESSORIES INSTALLATION

- A. Install accessory materials according to sheet barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of sheet barrier.
 1. Coordinate installation of sheet barrier with installation of roofing membrane and base flashing to ensure continuity of sheet barrier with roofing membrane.
 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane sheet barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. 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.
- D. Wall Openings: Prime concealed, perimeter frame surfaces of windows, exterior louvers, and doors. Apply transition strip 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.
 1. Transition Strip: Roll firmly to enhance adhesion.
- E. Fill gaps in perimeter frame surfaces of windows, exterior louvers, and miscellaneous penetrations of air-barrier material with foam sealant.
- F. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- G. Seal top of through-wall flashings to sheet barrier with an additional 6 inch-wide, transition strip.

- H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
 - 1. 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.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements:
 - 1. Continuity of air-barrier system has been achieved throughout building envelope with no gaps or holes.
 - 2. Continuous structural 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. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed.
 - 7. Laps in sheet materials have complied with the minimum requirements and have been shingled in correct direction (or mastic applied on exposed edges), with no fishmouths.
 - 8. Termination mastic has been applied on cut edges.
 - 9. Air barrier has been firmly adhered to substrate.
 - 10. Compatible materials have been used.
 - 11. Transitions at changes in direction and structural support at gaps have been provided.
 - 12. Connections between assemblies (sheet barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 13. All penetrations have been sealed.
- C. Barrier will be considered defective if they do not pass tests and inspections.
 - 1. A visual inspection of the sheet barrier shall be conducted and any leaks noted shall be sealed.
 - 2. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 3. Remove and replace deficient air-barrier components for retesting as specified above.
- D. Repair damage to sheet barriers caused by testing; follow manufacturer's written instructions.
- E. Prepare test and inspection reports.

3.07 CLEANING AND PROTECTION

- A. Protect water resistive air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect sheet barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace sheet barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 - 2. Protect sheet 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 completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction

END OF SECTION

SECTION 074213 - METAL WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap-seam metal wall panels.
2. Metal soffit panels.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate metal wall and soffit panel assemblies with rain drainage Work, flashing, trim, construction of soffits, and other adjoining Work to provide a leakproof, secure, and noncorrosive installation.

B. Preinstallation Meetings: Conduct meeting at Project site.

1. Attendees: Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, Installer, manufacturer's representative, structural-support Installer, and installers whose Work interfaces with or affects metal wall panels.
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 metal wall panel 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 siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
2. Include type of coating system, DTF of each coat, product physical properties, accelerated test data and pretreatment data.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1 1/2 inches per 12 inches:

C. Samples for Selection: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width.

D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, clips, closures, and other metal panel accessories.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.
- D. Coating Applicator Qualification: Provide coating applicator certification.
- E. Delegated Design Submittal: Structural calculations for panel system including attachments, clips and subgirts, stamped registration seal and signed by licensed structural engineer, licensed in state of project.
 1. Show anchorage detail fabrication and attachment; indicate quantity, diameter, and depth of penetration of anchors.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm that specializes in manufacturing of specified metal wall panel systems and shop-applied coating systems with a minimum of 10 years of documented experience.
- B. Coating Applicator Qualifications:

1. Applicator regularly engaged in application of shop-applied coating systems of similar type to that specified.
2. Employ persons trained for application of shop-applied coating systems.
3. Approved by manufacturer.
4. Equipped, trained, and approved for application of shop-applied coating systems required for this Project.
5. Approved to provide warranty specified in this Section.
6. Certified Fluropone Pure Applicator.

- C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer with a minimum of 5 years of documented experience.
- D. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- E. Mockups: Build Partial Mockup per Section 014339 - Mockups to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1.07 STORAGE, AND HANDLING

- A. Deliver components, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.08 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturer's written instructions and warranty requirements.

1.09 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include the following:

- a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 2. Warranty Period: 5 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes the following:
 - a. Color fading more than 5 Hunter units when tested per ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested per ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: Minimum 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer to design attachments, clips, subgirts, and seismic anchorage by a qualified professional engineer licensed in state of project, using performance requirements and design criteria
- B. Structural Performance: Provide metal panel assemblies capable of withstanding effects of gravity loads, based on the following testing: per ASTM E1592:
 1. Formed Metal Wall Panels per ASTM E 1592.
- C. Wind Loads: As indicated on Structural Drawings.
 1. Air Infiltration, ASTM E 283:
 - a. Formed Metal Wall and Ceiling Panels: Maximum 0.01 cfm/square foot at static air pressure difference of 1.57 lbf/square foot.
 2. Deflection Limits: For wind loads, no greater than L/180 of span.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/square foot.

F. Corrosion Control: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.02 MANUFACTURERS

A. Manufacturers: Provide products by one of the following:

1. ATAS International, Inc.
2. CENTRIA Architectural Systems.
3. Kingspan Group Company.
4. Metal Sales Manufacturing Corporation.
5. MetalSpan.
6. Pac Clad.

2.03 METAL WALL PANELS (MWP)

A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Wall Panels: Provide the following:

1. Metal Wall Panel (MWP-1): Provide products by Metal Sales or accepted equal:
 - a. Style: TL-17D.
 - b. Depth: 1 1/2 inches.
 - c. Panel Coverage: 12 inches.
 - d. Thickness: 0.032 inches..
 - e. Color: Custom as selected by Architect from industry's full range.
2. Metal Wall Panel (MWP-2): Provide products by Metal Sales or accepted equal:
 - a. Style: TL-1262.
 - b. Depth: 1 1/2 inches.
 - c. Panel Coverage: 12 inches.
 - d. Thickness: 0.032 inches .
 - e. Color: Custom as selected by Architect from industry's full range.
3. Metal Wall Panel (MWP-3): Provide products by Metal Sales or accepted equal:
 - a. Style: TL-1226.
 - b. Depth: 1 1/2 inches.
 - c. Panel Coverage: 12 inches.
 - d. Thickness:0.032 inches.
 - e. Color: Custom as selected by Architect from industry's full range.

2.04 METAL SOFFIT PANELS (MSP)

- A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Material: Galvanized Aluminum; AZ50 galvalume conforming to ASTM A 792/A 792M, minimum grade 33, prepainted by the coil-coating process per ASTM A 755/A 755M.
 - 1. Basis of Design: Provide soffits by Metal Sales Manufacturing Corporation.
 - a. Style: Solid.
 - b. Depth: 1 inch.
 - c. Panel Coverage: 12 inches.
 - d. Thickness: 0.032 inch.
 - e. Color: Custom as selected by Architect from industry's full range.
- C. Flush Profile Metal Soffit Panels: Solid and perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced flat pan between panel edges; with flush joint between panels.
 - 1. Concealed fasteners.

2.05 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653, G90 coating designation or ASTM A792, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Coordinate with Section 076200 - Sheet Metal Flashing and Trim to provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
 - 1. Aluminum Panels: Use aluminum or metal recommended by manufacturer.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.
- F. Sub-Framing Thermal Spacer Systems: As specified in Section 072100 - Thermal Insulation.

2.06 FINISHES

- A. High-Performance Liquid Fluoropolymer Red-List free Paint (PVDF):
 - 1. Exterior Surface: AAMA 2605-17; at least 70 percent PVDF resin by weight in color coat; 2-coat system.
 - a. Basis of Design: Provide Fluropon Pure by Sherwin Williams or accepted equal:
 - 1) Color Retention: Less than 5 Delta E in 10 years.
 - 2) Pre-Treat: Minimum 40 mg/ square foot chrome.
 - 3) Prohesion: ASTM G85 Annex A5, at least 2,000 hours.
 - 4) Humidity Testing: ASTM D2247, at least 4,000 hours.
 - 5) Health Product Declaration: Current third-party verified HPD disclosing (LBC) Red-List Approved or Red-List Free.
 - 2. Concealed Conditions: Apply pretreatment and 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; AAMA 2603-17.
- B. Liquid Strippable Coating: Apply in shop to prefinished surfaces to protect finish during fabrication, shipping, and field-handling.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.07 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at factory, by manufacturer's standard procedures and processes, and as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with separator strips that provide weathertight seal and prevent metal-to-metal contact, and minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of Work.
 - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Where applies, examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 1. 1/8 inch in 20 feet in any direction.
 2. 1/4 inch over any single wall plane.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorage per ASTM C754 and metal panel manufacturer's written instructions.

3.03 INSTALLATION, GENERAL

- A. Install metal panel system in accordance with manufacturer's written instructions, approved Shop Drawings, and Record Drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Erect panels level and plumb, in proper alignment in relation to substructure framing and established lines.
- C. Panel anchorage shall be structurally sound and per engineering recommendations.
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal panel manufacturer.
- E. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- F. Install concealed gaskets, joint fillers, insulation, and flashings, as the Work progresses, to make panels weathertight.

3.04 METAL PANEL INSTALLATION

- A. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes; ensure penetrations are installed weather and water tight.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel Work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a 4 panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weather-tight escutcheons for pipe- and conduit-penetrating panels.

3.05 ACCESSORY INSTALLATION

- A. Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturers; or, if not indicated, types recommended by metal panel manufacturer.
 2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.06 FLASHING AND TRIM INSTALLATION

- A. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. 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. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.07 FIELD QUALITY CONTROL

- A. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- B. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

3.08 ADJUSTING

- A. Restore finishes damaged during installation and construction period so no evidence remains of correction work.
- B. Items that cannot be refinished in the field, removed and transport to the shop; make required alterations and refinish entire unit or provide new unit.

3.09 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Clean exposed surfaces of wall panels that are not protected by temporary covering to remove fingerprints and soil during construction period.
- C. Clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Protect wall panels from damage during construction. Use temporary protective coverings where needed as approved by the wall panel manufacturer.
- E. Clean and touch up minor abrasions in finished with air-dried coating that matches color and gloss of, and is compatible with, factory applied finish coating.
- F. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- G. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 075216 - SBS MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
2. Substrate board.
3. Vapor barrier.
4. Roof insulation.
5. Cover board.
6. Walkways pad.

1.02 DEFINITIONS

- ##### A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.03 PREINSTALLATION MEETINGS

- ##### A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review Fire Safety Plan.

1.04 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:
 - 1. Layout and thickness of insulation.
 - 2. Base flashings and membrane terminations.
 - 3. Flashing details at penetrations.
 - 4. Tapered insulation, including slopes.
 - 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 - 6. Crickets, saddles, and tapered edge strips, including slopes.
 - 7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 - 8. Tie-in with adjoining air barrier.

- B. Samples for Selection:
 - 1. Walkway Pads or rolls: Samples of manufacturer's standard colors for selection by Architect.

- C. Samples for Verification: For the following products:
 - 1. Cap Sheet.
 - 2. Flashing Sheet.
 - 3. Walkway Pads or Rolls.

- D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.

- B. Manufacturer Certificates:
 - 1. Performance Requirement Certificate: Signed by roof membrane manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of complying with performance requirements.
 - 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that materials supplied under this Section are acceptable for special warranty.

- C. Product Test Reports: For roof membrane and insulation, tests performed by a qualified testing agency, indicating compliance with specified requirements.

- D. Evaluation Reports: For components of membrane roofing system, from ICC-ES.

- E. Field Test Reports:

1. Concrete internal relative humidity test reports.
 - F. Field quality-control reports.
 - G. Sample Warranties: For manufacturer's special warranties.
 - H. Fire Safety Plan: Submit copy of plan.
- 1.06 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For roofing system to include in maintenance manuals.
- 1.07 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
 - B. Fire Safety Plan: Create a fire safety plan.
 1. Determine potential risks.
 2. Create risk control plan.
 3. Create and implement risk control include ground to roof communication.
 4. Train staff.
 5. Create a general roof emergency evacuation procedure.
 - C. Mockups: Build Partial Mockups per Section 014339 -Mockups to set quality standards for materials, execution and sequencing. Include typical conditions, transitions, terminations.
 1. Location: As selected by Architect.
 2. Size: At least 10 feet by 10 feet.
 3. Vapor Barrier Bond Test: Test bond to concrete roof deck to establish Concrete Surface Profile (CSP) value acceptable for adhesion and to determine installation timing for vapor barrier.
- 1.08 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
 - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
 1. Protect stored liquid material from direct sunlight.
 2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
 - 1. Store in a dry location.
 - 2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.09 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, cover boards, vapor barriers, substrate board, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion, ND.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor barriers, and walkway products, for the following warranty period:
 - 1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist wind uplift pressures indicated on Structural Drawings when tested according to FM Approvals 4474, UL 580, or UL 1897:
- D. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.
 - 1. Identify products with appropriate markings of applicable testing agency.
- F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated.
 - 1. Identify products with appropriate markings of applicable testing agency.
- G. SBS-Modified Asphalt Properties:
 - 1. Polymer Percentage: Maximum 13 percent.
 - 2. Filler Material: Maximum 35 percent.
 - 3. Elongation: Minimum 1000 percent.
 - 4. Flexibility: At least to 20 degrees F.

2.02 MANUFACTURERS

- A. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturer approved by roof membrane manufacturer.
- B. Basis of design: Provide products by Siplast or acceptable products by one of the following:
 - 1. Firestone Building Products
 - 2. GAF.
 - 3. IKO Industries Inc.
 - 4. Johns Manville; a Berkshire Hathaway company.
 - 5. Soprema, Inc.
 - 6. Tremco Incorporated.
 - 7. Accepted substitution.

2.03 BASE PLY MATERIALS

- A. SBS-Modified Bitumen Polyester Mat Base Ply: ASTM D6164, Type I, Grade S, SBS-modified asphalt sheet, reinforced with polyester fabric, smooth surfaced, suitable for cold adhesive or hot asphalt application method.

2.04 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS CAP PLY SHEET

- A. Granule-Surfaced Roofing Cap Sheet: ASTM D6164, Type II, Grade G, SBS-modified asphalt sheet, reinforced with polyester fabric, suitable for cold adhesive application method.
 - 1. Thickness: 130 mils.
 - 2. Coverage weight: Minimum 80 pounds.
 - 3. Elongation Peak Load: In accordance with ASTM D 5147.
 - 4. Tear Strength: Minimum of 120 lbf.
 - 5. Fire Rating: Class A.
 - 6. Granule Color: Gray.

2.05 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D4601, Type II, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
- B. Granule-Surfaced Flashing Sheet: ASTM D6164, Type I or II, Grade G, SBS-modified asphalt sheet, reinforced with polyester fabric, granule surfaced, suitable for application method specified, and as follows:
 - 1. Granule Color: Match cap sheet.
- C. Liquid Flashing System: Roof membrane manufacturer's standard one- or two-part moisture curing resin with low solvent content, consisting of a primer, flashing cement, and scrim.

2.06 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesives and sealants 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."
- B. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- D. Cold-Applied Asphalt Adhesive: ASTM D3019, Type III, roof membrane manufacturer's standard asphalt-based, one- or two-part, asbestos-free, solvent-free, cold-applied adhesive, specially formulated for compatibility and use with roofing membrane plies and base flashings.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

- F. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.07 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C1177, glass-mat, water-resistant gypsum substrate or ASTM C1278, fiber-reinforced gypsum board.
 - 1. Products: Provide one of the following:
 - a. Georgia Pacific Gypsum, LLC: DensDeck Prime.
 - b. Approved Substitution.
 - 2. Thickness: Type X, 5/8 inch.
 - 3. Surface finish: Primed.
 - 4. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.
 - 5. Screw shall be of sufficient length to penetrate through the top flange of underlying steel roof deck.

2.08 VAPOR BARRIER

- A. Self-Adhering-Sheet Vapor Barrier: Polyethylene film laminated to layer of butyl rubber adhesive, minimum 30-mil-total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-barrier manufacturer.

2.09 ROOF INSULATION

- A. General: Preformed roof insulation boards, manufactured or approved by roof membrane manufacturer and approved for use in FM Approvals' RoofNav listed roofing system identical to that used for Project.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2 or 3, glass-fiber mat facer on both major surfaces.
 - 1. Compressive Strength: 20 psi.
 - 2. Size: 48 by 48 inches.
 - 3. Thickness:
 - a. Base Layer: 2 inches.
 - b. Upper Layer(s): As indicated on Drawings.

2.10 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Full-spread spray-applied, low-rise, two-component urethane adhesive.
 - 2. Adhesives and sealants 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. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
- E. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
- F. Cover Board: ASTM C1177, glass-mat, water-resistant gypsum board or ASTM C1278, fiber-reinforced gypsum board.
 - 1. Products: Provide one of the following:
 - a. Georgia-Pacific Gypsum LLC: DensDeck Prime.
 - b. National Gypsum Company: DEXcell FA Glass Mat Roof Board.
 - c. United States Gypsum Company: Securock Glass-Mat Roof Board.
 - d. Approved substitutions.
 - 2. Thickness: 1/2 inch.
 - 3. Surface Finish: Factory primed.

2.11 WALKWAYS

- A. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 1/2 inch thick, minimum.
 - 1. Pad Size: Approximately 36 by 60 inches.
 - 2. Color: Contrasting with cap sheet.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.

2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 3. Verify that minimum repaired concrete drying period recommended by roofing system manufacturer has passed.
 4. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
 - a. Test Frequency: One test probe per each 1000 square feet of roof deck, with not less than three test probes.
 - b. Submit test reports within 24 hours of performing tests.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.
 1. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
 1. Remove roof-drain plugs when no Work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's recommendations.
 1. Submit test result within 24 hours of performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.03 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast.
 1. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.
- D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified in Section 072500 - Weather Barrier.

- E. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.04 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.05 VAPOR BARRIER INSTALLATION

- A. Self-Adhering-Sheet Vapor Barrier: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor barrier over area to receive vapor barrier, side and end lapping each sheet a minimum of 3 1/2 and 6 inches, respectively.
 - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of the insulation and cover board.
 - 2. Seal laps by rolling.
- B. Completely seal vapor barrier at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.06 INSULATION INSTALLATION

- A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degree F.
- D. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.

- a. Locate end joints over crests of decking.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
 - 1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - e. Trim insulation, so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements as follows:
 - 1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- E. Installation Over Concrete Decks:
1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - b. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - c. Fill gaps exceeding 1/4 inch with insulation.
 - d. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

- e. Adhere base layer of insulation to vapor barrier according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
 - 1) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- 2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements as follows:
 - 1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.07 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board, so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 - 4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements as follows:
 - a. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.08 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.
- C. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
 - 2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.09 BASE SHEET INSTALLATION

- A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.
- B. Installation of SBS-Modified Bitumen Polyester-Mat Base Sheet:
 - 1. Extend roofing sheets over and terminate above cants.
 - 2. Install base sheet in a shingle fashion.
 - 3. Adhere to substrate in a uniform coating of cold-applied adhesive.
 - 4. Install base sheet without wrinkles, rears, and free from air pockets.
 - 5. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
 - a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
 - b. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches.
 - c. Stagger end laps not less than 18 inches.
 - d. Completely bond and seal laps, leaving no voids.
 - e. Roll laps with a 20-pound roller.
 - 6. Repair tears and voids in laps and lapped seams not completely sealed.
 - 7. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.10 SBS-MODIFIED BITUMINOUS CAP SHEET INSTALLATION

- A. Before installing, unroll cap sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature at which cap sheet will be installed.
- B. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
 - 1. Extend cap sheet over and terminate above cants.
 - 2. Install cap sheet in a shingle fashion.
 - 3. Install cap sheet as follows:
 - a. Adhere to substrate in cold-applied adhesive.
 - 4. Install cap sheet without wrinkles or tears, and free from air pockets.
 - 5. Install cap sheet, so side and end laps shed water.
- C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
 - 1. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
 - 2. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches.
 - 3. Stagger end laps not less than 18 inches.
 - 4. Completely bond and seal laps, leaving no voids.
 - 5. Roll laps with a 20 pound roller.
 - 6. Repair tears and voids in laps and lapped seams not completely sealed.
- D. Apply pressure to the body of the cap sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.11 BASE FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - 2. Backer Sheet Application:
 - a. Adhere backer sheet to substrate in cold-applied adhesive.
 - 3. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 - 1. Seal top termination of base flashing.
- D. Install liquid flashing system according to manufacturer's recommendations.
 - 1. Extend liquid flashing not less than 3 inches in directions from edges of item being flashed.
 - 2. Embed granules, matching color of roof membrane, into wet compound.
- E. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
- F. Roof Drains: Set 30 by 30 inch 4 pound lead flashing in bed of asphaltic adhesive on completed roofing membrane.
 - 1. Cover lead flashing with roofing cap-sheet stripping, and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane.
 - 2. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
 - 3. Install stripping according to roofing system manufacturer's written instructions.

3.12 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
 - 1. Install walkways at the following locations:
 - a. Locations indicated on Drawings.
 - b. As required by roof membrane manufacturer's warranty requirements.
 - 2. Provide 3 inch clearance between adjoining pads.
 - 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Manufacturer's Field Service:
 - 1. Perform technical field inspection services intermittently during and following roofing installation.
 - 2. Determine conformance to manufacturer's instructions and Warranty provisions.
 - 3. Promptly notify Contractor, and Architect of non-conforming work.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Roofing system will be considered defective if it does not pass tests and inspections.
 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.14 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
 1. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

1. ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: Oregon State University.
 2. Address: 875 SW 26th St., Corvallis, OR 97331
 3. Building Name/Type: LaSells Stewart Center
 4. Area of Work: Roof and top floors.
 5. Acceptance Date: _____.
 6. Warranty Period: 3 years.
 7. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Fire;
 - c. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - d. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - e. Vapor condensation on bottom of roofing; and
 - f. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sheet steel and coil for sheet metal flashings and trim.
2. Flexible Flashing.
3. Reglets with counterflashing.
4. Sheet metal fabrications and formed systems including gutters, scuppers, coping, and stainless steel sill pans.
5. Factory prefinished coating systems.
6. Accessories

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. 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.
2. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

B. Preinstallation Meetings: Conduct meeting 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 affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, attachment and installation details.
2. Describe general construction, configuration, profile, jointing pattern, jointing details, expansion-joint locations, and keyed details.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.

4. Detail formed flashing and trim at a scale of not less than 1 1/2 inches per 12 inches.

1.04 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Test reports of each self adhered flashings compatibility with each roof and wall barrier systems and substrates.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing, trim, and accessories, to include in maintenance manuals.
- B. Special warranty.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance with a minimum 5 years documented experience installing commercial work.
- B. Refer to SMACNA recommendations for configuration and installation.
- C. Exposed sharp corners are not allowed.
- D. Mockups: Build Partial Mockup per Section 014339 - Mockups to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Mockup to be included with adjacent materials mockups to establish and coordinate appearance and workmanship.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with dissimilar materials that might cause staining, denting, or other surface damage.
 1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
 2. Protect stored sheet metal flashing and trim from contact with water, excessive moisture.
 3. Protect with breathable material.
 4. Store materials off of ground.
- 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.

1.08 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes the following:
 - a. Color fading more than 5 Hunter units when tested per ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested per ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - d. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Weathertightness: Contractor to provide 2 year material and labor weathertightness Warranty for work of this Section subject to conditions of ordinary wear and usage.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashing tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting design pressure as indicated on Drawings.
 - 1. Design Pressure: As indicated on Structural Drawings.
- 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 (Range): 120 degree F., ambient; 180 degree F., material surfaces.

2.02 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

- B. Stainless-Steel Sheet: ASTM A240, Type 304, dead soft, fully annealed, 0.019 inch thick, smooth, flat surface.
1. Finish: ASTM A480/A480M, No. 4 (polished directional satin).
 - a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1) Run grain of directional finishes with long dimension of each piece.
 - 2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Lead Sheet: ASTM B749 lead sheet, 4 pounds.
- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50Grade 40; prepainted by coil-coating process to comply with ASTM A755/A755M
1. Surface: Smooth.
 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Red-list free Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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. Color: Custom as selected by Architect from paint industry's full range.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.03 FLEXIBLE FLASHING MATERIALS

- A. Self-Adhering, High-Temperature Flashing: Slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal flashing; suitable for high temperatures over 240 degrees F. Provide primer in accordance with manufacturer's written instructions.
1. Products: Provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.: WIP 300HT.
 - b. GCP Applied Technologies Inc.: Grace Ice and Water Shield HT.
 - c. Henry Company: Blueskin PE200 HT.
 - d. InterWrap Inc.: Titanium PSU30.
 - e. MFM Building Products Corp.: Wind & Water Seal.
 - f. Polyguard Products, Inc.: Deckguard HT.
 - g. Protecto Wrap Company: Protecto Jiffy Seal Ice & Water Guard HT.

2. Thickness: Minimum of 40 mils.
3. Allowable UV Exposure Time: Not less than 60 days.
4. Thermal Stability: ASTM D1970, stable after testing at 240 degrees F.
5. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degrees F.
6. Location: Provide under metal coping, metal flashing, and over roof curbs.
 - a. Test and ensure compatibility with selected roof and wall barrier systems. Provide test report to Architect for review.

B. Self-Adhering Flashing: Cross-laminated, high-density polyethylene or polypropylene film, top surface laminated to layer of butyl, with release-paper backing.

1. Provide primer in accordance with manufacturer's written instructions.
2. Test and ensure compatibility with selected air barrier system and substrates.
3. Thickness: 19 mils minimum.
4. Water Vapor Permeance: ASTM E96, 33 perms.
5. Tensile Strength: At least 975 psi.
6. UV Exposure Rating: At least 120 days.
7. Nail Sealability: ASTM D1970, Pass.
8. Surface Burning Characteristics ASTM E84.
 - a. Flame Spread: Class A.
 - b. Smoke Development: Class A.
9. Thermal Stability: ASTM D1970, stable after testing at 180 degrees F.
10. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 degrees F.
11. Location: Provide at penetrations, material transitions.
 - a. Test and ensure compatibility with selected roof and wall barrier systems. Provide test report to Architect for review.

2.04 PMMA RESIN FLASHING SYSTEM

A. Resin Flashing System: Liquid-applied, catalyzed polymethyl methacrylate primer (PMMA), fully reinforced, multi-component flashing system consisting of a basecoat and topcoat combined with a non-woven polyester fleece installed over a prepared or primed substrate.

1. Products: Provide one of the following:
 - a. American Hydrotech, Inc.: Hydroseal Resin Liquid Applied Flashing.
 - b. Kemper System, Inc.: Kemperol 2K-PUR.
 - c. Soprema, Inc.: ALSAN RS 230 Flash.
 - d. Urethane Polymers International, Inc.: UIM-6430.

B. Accessories:

1. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated.
2. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

2.05 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: No 12 to 14 by 7/8 inch, self-drilling, self-taping, non-corrosive fasteners. Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Concealed Sheet Metal Fasteners: No. 12 to 14, panhead, self-drilling, self-tapping, non-corrosive fasteners, and as instructed by manufacturer.
 - d. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - e. Termination Bars: Corrosion resistant aluminum material with mill finish or a stainless steel alloy.
 - 2. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
 - 3. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
 - 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Single Pipe Flashing at Roofing Systems: Neoprene with 4 inch flange, and as accepted by manufacturer for type of roof system.
- D. Solder:
 - 1. For Lead: ASTM B32, with maximum lead content of 0.2 percent.
 - 2. For Stainless Steel: ASTM B32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
- E. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- F. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- G. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- H. Electrolytic Protection: Bituminous Coating; Cold-applied asphalt emulsion complying with ASTM D1187 not less than 15 mils dry film thickness.
- I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- J. Rivets: Close-ended watertight of corrosion-resistant material compatible with material being secured.
- K. Reglets and Counterflashings: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 1. Source Limitations: Obtain reglets for single source from single manufacturer.
 - 2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 - 3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 - 4. Finish: As selected by Architect from full range of paint industry's colors.
 - 5. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

2.06 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Shop-fabricate sheet metal flashing and trim to greatest extent possible.
 - 2. 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.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Metal Coping Fabricators: Contractor's option to provide shop-fabricated metal copings.

1. Fabricate and install copings per ANSI/SPRI/FM 4435/ES-1 requirements.
 - C. 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.
 - 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 per cited sheet metal standard. Install laps with 3 continuous beads of non-shrinking butyl sealant.
 - F. Continuous Cleats and Starter Strips: Fabricate cleats and attachment devices of one gauge heavier than sheet material, in widths required by SMACNA to interlock with sheet, but not less than thickness of metal being secured. Metal to be noncorrosive and compatible with material being anchored to.
 - G. Drip edges to be minimum 3/4 inch long with 1/2 inch seams. Cleats to have minimum 1/2 inch engagement.
 - H. Seams:
 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - I. Do not use graphite pencils to mark metal surfaces.
- 2.07 ROOF-DRAINAGE SHEET METAL FABRICATIONS
- A. Gutters:
 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
 2. Fabricate roll form gutters in continuous 50 foot lengths.
 3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
 4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Locate at equal distance between downspouts. Do not exceed 50 foot length of gutter without expansion joint.
 5. Shop fabricate interior and exterior corners. Make watertight.
 6. Gutter Profile: As shown on Drawings.
 7. Fabricate front edge of gutter minimum 1 inch below back of gutter and as necessary for overflow water to spill over face of gutter.
 8. Expansion Joints: Butt type with cover plate.
 9. Suspend from gutter cleat system without penetrating gutter.
 10. Gutter Outlets: Size to fit minimum 4 inch deep into downspout.

- B. Material: Prefinished aluminum alloy, 0.40 inch thick minimum, and as recommended by SMACNA.
 - 1. Finish: Factory applied PVDF finish conforming to AAMA 2605-17, prefinished custom color to match flashing and metal panel finish.
 - 2. Stand-offs: Fabricate of same gauge and finish as gutter and as necessary to hold gutters plumb and true off fascias.
- C. Downspouts:
 - 1. Prefinished Aluminum Downspout: 4 inch diameter, 0.032 inch thick. Match custom gutter finish.
- D. Downspout Hangers and Straps: Conform to details shown on Drawings. Fabricate to hold downspouts tight to wall.
 - 1. Fasteners: Stainless steel for mounting to walls.
- E. Cast Aluminum Drain Guard: Provide products by Marathon Roofing Products Inc. or accepted equal.
 - 1. Profiled to suit gutters and downspouts.
 - 2. Scissor expansion anchor fitting into drain or downspout.
 - 3. Size to suite condition of installation.
 - 4. Wire strainers not accepted.
- F. Splash Pans: Stainless steel of same gauge as sheet metal on project. Fabricate to SMACNA Figure 1-36 and verify with Architect.
- G. Conductor Heads, Scuppers, and Copings:
 - 1. Custom fabricate from coated steel, and as shown on Drawings.

2.08 MISCELLANEOUS ACCESSORIES

- A. Pipe and Tube Ring Clamp: Provide a marine grade, 301 stainless steel, ring clamp in diameter needed to secure pipe/tube as indicated on Drawings.
- B. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- C. Termination Bars for Flexible Flashing: Stainless-steel sheet 0.019 inch by 1 1/2 inches with a 3/8 inch sealant flange at top.
 - 1. Termination bars to be flat where PMMA or flashing membrane to be installed over termination bar.

2.09 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from 0.028 inch thick galvanized steel.
- B. Sheet metal flashing stretch-out dimensions of 11 inches or larger shall be fabricated with 22 gauge minimum pre-finished sheet metal.

2.10 FINISHES

- A. Coil High-Performance Liquid Fluoropolymer Paint (PVDF) Finish:
 - 1. Exterior Surface: AAMA 2605-17; at least 70 percent PVDF resin by weight in color coat; 2-coat system.
 - a. Basis of Design: Provide Fluoron Pure by Sherwin Williams or accepted equal:
 - 1) Color Retention: Less than 5 Delta E in 10 years.
 - 2) Pre-Treat: Minimum 40 mg/ square foot chrome.
 - 3) Prohesion: ASTM G85 Annex A5, at least 2,000 hours.
 - 4) Humidity Testing: ASTM D2247, at least 4,000 hours.
 - 5) Health Product Declaration: Current third-party verified HPD disclosing (LBC) Red-List Approved or Red-List Free.
 - 2. Concealed Conditions: Apply pretreatment and 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; AAMA 2503-17.
 - 3. Include strippable protective film for protection of prefinished steel finish.
- B. Stainless-Steel Sheet: ASTM A480/A480M, No. 4 (polished directional satin).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of 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.
 - 4. Test and ensure compatibility of self adhered flashings with selected roof and wall barrier systems and substrates. Provide test report to Architect for review.
- B. For record documentation, prepare written report, endorsed by installer, listing conditions detrimental to performance of Work.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FLEXIBLE FLASHING INSTALLATION

- A. Self-Adhering High-Temperature Flashing: Apply primer if required by manufacturer. Comply with temperature restrictions of manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3 1/2 inches. Extend into gutter trough. Roll laps with roller. Cover within 14 days.

3.03 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated on Drawings and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 3. Anchor sheet metal flashing and trim and other components of Work securely in place, with provisions for thermal and structural movement.
 - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 - 5. Install continuous cleats with fasteners spaced not more than 12 inches on center.
 - 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least 2 fasteners. Bend tabs over fasteners.
 - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 - 8. Do not field cut sheet metal flashing and trim by torch or electric saw.
 - a. Prime cut edges and coat to protect against corrosion.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of uncoated aluminum and 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 and trim directly on cementitious or wood substrates, install a course of high heat-resistant self-adhered membrane roofing underlayment under flashing.
- C. Exothermic Reaction: Where metal flashing is used under foamed-in-place insulation provide metal protection to reduce conductivity of heat to adjacent materials that can be adversely affected by the heat from foam installation.
- D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 3. Use lapped expansion joints only where indicated on Drawings.
- E. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- F. Conceal fasteners and expansion provisions where possible in exposed Work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- G. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 d F, set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 degree F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 - Joint Sealants.
- H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. 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.
 2. Do not solder metallic-coated steel and aluminum sheet.
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder and flow solder into joint.
 - a. Fill joint completely.
 - b. Completely remove flux and spatter from exposed surfaces.
 5. Stainless-Steel Soldering:
 - a. Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux.
 - b. Promptly remove acid flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.04 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system per cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

- B. Hanging Gutters:
 - 1. Join sections with riveted and soldered joints or with joints sealed with sealant.
 - 2. Attach gutters at eave or fascia to firmly anchor them in position.
 - 3. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 4. Anchor gutter to wood blocking or other acceptable backing with straps spaced not more than 18 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
 - 5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

- C. Downspouts: Provide downspouts where indicated on Drawings, but no more than 1 every 50 feet of gutter.
 - 1. Locate hangers at top and bottom of downspouts and at approximately 60 inches on center. Provide hangers with fasteners designed to hold downspouts securely to walls.
 - 2. Provide elbows at base of downspout to direct water away from building.

- D. Splash Pans:
 - 1. Install where downspouts discharge on low-slope roofs. Set in adhesive material compatible with roofing.

- E. Parapet Scuppers:
 - 1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 2. Anchor scupper closure trim flange to exterior wall and soldered or seal with elastomeric sealant to scupper.
 - 3. Loosely lock front edge of scupper with conductor head.
 - 4. Soldered or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

- F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.05 ROOF FLASHING INSTALLATION

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
 - 1. Provide concealed fasteners where possible, set units true to line, levels, and slopes.
 - 2. Install Work with laps, joints, and seams that will be permanently watertight and weather resistant.

- B. Copings:
 - 1. Install copings in accordance with ANSI/SPRI/FM 4435/ES-1.
 - 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
 - 3. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24 inch centers.
 - 4. Anchor interior leg of coping with screw fasteners and washers at 24 inch centers.

- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints a minimum of 4 inches.
 - 4. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant, or interlocking folded seam or blind rivets and sealant unless indicated otherwise.

- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.06 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.

3.07 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.

3.08 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 manufacturer's 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

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Roof hatches.
 2. Equipment supports.
 3. Safety railing system.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of roof accessory.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof accessories.
1. Include plans, elevations, keyed details, and attachments to other Work. Indicate dimensions, loadings, and special conditions. Distinguish between factory and field assembled Work.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
 4. Required clearances.
- B. Sample Warranties: For manufacturer's special warranties.

- C. Delegated Design Submittal: For equipment supports and safety guardrails indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in state of project responsible for their preparation.
 - 1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 - 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.
- B. Special Warranty.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a dry, ventilated location out of direct sunlight and weather in accordance with manufacturer's written instructions.
- B. Deliver in original, unopened container and packing bearing name of manufacturer and product identification.

1.07 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 - Quality Requirements, to design equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer licensed in state of project, using performance requirements and design criteria indicated.
- B. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

- C. Wind-Restraint Performance: As indicated on Structural Drawings.

2.02 ROOF HATCHES

- A. Roof Hatches: Metal roof-hatch units with lids and insulated, thermally broken, walled curbs, fully welded at corners, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
1. Product: Provide products by one of the following:
 - a. Babcock-Davis.
 - b. Bilco.
 - c. Nystrom.
 - d. Precision Ladders.
 2. Type and Size: Single-leaf lid, to match existing roof opening as indicated on Drawings.
 3. Loads: Minimum 40 lbf/square feet external live load and 20 lbf/square feet internal uplift load.
 4. Cover and Frame Material:
 - a. Thickness: Manufacturer's standard thickness.
 - b. Finish: As selected by Architect from manufacturer's full color range.
 5. Thermally Broken: R-20 min.
 6. Construction:
 - a. Insulation: Glass-fiber board or polyisocyanurate board.
 - b. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 - c. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 - d. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 - e. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 - f. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - g. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.
 7. Hardware: Spring operators, hold-open arm, stainless-steel spring latch with turn handles, heavy duty stainless-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - a. Provide 2-point latch on lids larger than 84 inches.
 - b. Lift Assistance: Compression spring operator enclosed in telescopic tubes. Automatic hold-open arm with grip handle release.

2.03 SAFETY EQUIPMENT

- A. Roof Hatch Safety Railing System: Spring-loaded, self-closing safety railing system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Basis of Design: Provide products by one of the following:
 - a. Safety Railing Source.
 - b. Bilco RL- Safety Rail System.
 - c. KeeHatch Safety Rail.
 - d. Babcock Davis.
 - e. Accepted substitution.
 2. Height: 42 inches above finished roof surface.
 3. Type of Installation: Permanent boot on installation of right and left handed railings, guard rails, mid railing and gate.
 4. Material:
 - a. Mounting Bracket: Kee Klamp fittings #161-7 or #162-7.
 - b. Pipe: Galvanized 1 1/4 inch ID A53 Grade B seamed steel or galvanized 1 5/8 inch OD A500 seamed tube.
 5. Gate System: 3/16 inch proof coil ASTM, zinc plated with quick links.
 6. Pipe Caps: Weather and light resistant vinyl 1 1/2 inch deep and to fit snugly over pipe ends or Kee Klamp 77-7 plugs.
 7. Bolts and Washers: Hex head bolts 3/8 inch by 2 1/2 inch or 1 1/4 inch grade Z, zinc plated.
 8. Railing Fitting: As recommended by manufacturer.
 9. Sealants for Brackets: As recommended by manufacturer.
 10. Labels: Safety no hoisting warning with manufacturer identification & patent number.
 11. Posts and Rails: Galvanized-steel pipe, 1 1/4 inches in diameter or galvanized-steel tube, 1 5/8 inches in diameter.
 12. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 13. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 14. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.; Sky facing weep holes not accepted.
 15. Fabricate joints exposed to weather to be watertight.
 16. Fasteners: Manufacturer's standard, finished to match railing system.
- B. Smoke Vent Safety Railing, 42 inch high.
1. Basis of Design: Babcock Davis, size to fit existing smoke vents.
 - a. Mounted to existing vent curb with brackets recommended by manufacturer.
 - b. Pipe: Hot-dipped galvanized.
- C. Curb Mounted Skylight Safety Railing, 42 inch high.

1. Basis of Design: Leading Edge skylight guardrail system, non-penetrating curb mounted, 42 inch high railing system.
 - a. Application: Use with skylights.
 - b. Pipe: Powder-coat, custom color as selected by the Architect.

2.04 EQUIPMENT SUPPORTS

- A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between Structural supports, including equipment loads and other construction indicated on Drawings, spanning between Structural supports; capable of meeting performance requirements; with welded corner joints, integral metal cant, and integrally formed structure-mounting flange at bottom.
 1. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
 2. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
 3. Material: Zinc-coated (galvanized) 0.079 inch thick.
 - a. Finish: Powder coat.
 - b. Color: As selected by Architect from manufacturer's full color range.
 4. Construction:
 - a. Curb Profile: Manufacturer's standard compatible with roofing system and roof slopes.
 - b. Insulation: Factory insulated with 3 inch thick glass-fiber board insulation.
 - c. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
 - d. Nailer: Factory-installed continuous wood nailers 5 1/2 inches wide on top flange of equipment supports, continuous around support perimeter.
 - e. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
 - f. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4 inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 - g. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
 - h. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 - i. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.
 - j. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.05 METAL MATERIALS AND FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation.
 - 1. Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard 2 coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
 - 2. 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.
- D. Steel Shapes: ASTM A36, hot-dip galvanized according to ASTM A123 unless otherwise indicated.
- E. Steel Tube: ASTM A500, round tube; Hot-dip galvanizing according to ASTM A123.
- F. Steel Pipe: ASTM A53, galvanized.

2.06 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Wood Nailers: As specified in Section 061000 - Rough Carpentry.
- C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.
- D. Underlayment: As specified in Section 076200 - Sheet Metal Flashing and Trim.
- E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Zinc-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153 or ASTM F2329.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- G. Sealants: As recommended by roof accessory manufacturer for installation indicated and compliant with Section 079200 - Joint Sealants.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum and stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.03 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780.

- B. Clean exposed surfaces according to manufacturer's written instructions.
- C. Clean off excess sealants.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Elastomeric joint sealants.
 - 2. Precompressed foam sealants.
 - 3. Joint sealant backing.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Conduct meeting at Project site.

1.03 ACTION SUBMITTALS

- A. Sealant Schedule: Submit schedule of sealant applications listing joint sealants proposed for this Work and materials to which joint sealants are specified to be applied. Obtain Architect's written approval of this sealant schedule before starting Work of this Section.
 - 1. Joint-Sealant Schedule: Include the following information:
 - a. Joint-sealant application, joint location, and designation.
 - b. Joint-sealant manufacturer and product name.
 - c. Joint-sealant formulation.
 - d. Joint-sealant color.
 - e. Joint-sealant VOC.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency and installer.
 - 1. Submit list of qualifying projects of similar scope.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.

- C. 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.
- D. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Sample Warranties: For special warranties.
- F. Product Installation Instructions: Submit for each product, accessory and component. Include surface preparation, cleaning, priming, joint size ratios, adhesion testing and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified per ASTM C1021 to conduct testing indicated.
 - 2. Test per SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- B. Installer Qualifications: Minimum of 5 years experience installing specified products and materials.
- C. Mockups: Install sealant in a Partial Mockups of assemblies specified in Section 014339 - Mockups; Provide mockups on substrates indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
 - 1. Including backing material, sealant, primer and other related products.
 - a. Conduct tests for each type of sealant and joint substrate with and without primer.
 - 2. Arrange tests to take place with sealant manufacturer's technical representative present.
 - 3. Approved mockups become standard for the Work.
- D. Stain Testing: Conduct stain tests in accordance with ASTM C 1248 on substrate materials with orientation and exposure that replicates finished joint conditions.
- E. Compatibility Testing: Include sealant and sealers or coatings that may come into contact with sealant following sealant application.

1.06 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 kind of sealant and joint substrate.

3. Notify Architect 7 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 per Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately: extend cut along 1 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.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a dry, ventilated location out of direct sunlight and weather in accordance with manufacturer's written instructions.
- B. Deliver in original, unopened container and packing bearing name of manufacturer and product identification.

1.08 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees 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.

1.09 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: 2 years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of structure caused by stresses on 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

2.01 JOINT SEALANTS, GENERAL

- A. Low Emitting Material: Sealants shall comply with requirements of California Department of Public Health's South Coast Air Quality Management District Rule 1168.
- B. 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.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
 - 1. Match adjacent substrates or match existing, provide either manufacturer's standard color if matching color is available, or, if not available, provide field-tintable custom color.
- D. Install joint sealant systems with a pressure gun.

2.02 EXTERIOR JOINT SEALANTS, VERTICAL

- A. Dynamic moving joints including materials having a high coefficient of linear expansion such as metal panels and window perimeters.
 - 1. Silicone: Single-component, low or ultra-low modulus, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use T.
 - a. Products: Provide one of the following:
 - 1) Dow Chemical Corporation: Dowsil 795 Silicone Building Sealant.
 - 2) Momentive Performance Materials, Inc.: GE SCS2700/ SilPruf LM.
 - 3) Sika Corporation: Sikasil WS-290. Tremco Incorporated: Spectrem 1.

- B. Perimeter caulking and glazing application such as aluminum, glass, steel, plastic, concrete, painted metal, and brick
 - 1. Silicone: Single-component, nonsag, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - a. Products: Provide one of the following:
 - 1) Dow Chemical Corporation: Dowsil 756 SMS Building Sealant Momentive Performance Material, Inc: SSG4000 UltraGlaze.
 - 2) Sika Corporation: SikaSil-C 995.
 - 3) Tremco Incorporated: Spectrem 3.
- C. Weather Barrier Sealant: Silicone, S, NS, 25 NT, single component, nonsag, +/- 25 percent movement, nontraffic use, neutral-curing silicone joint sealant; ASTM C920, Grade NS, Class 25; use NT.
 - 1. Basis of Design: Provide Dowsil 758 or accepted equal by Air- and water-resistive barrier manufacturer.
- D. Moving Joints: Joints and cracks receiving painted coating over sealant, use between dissimilar materials and EIFS.
 - 1. Elastomeric Hybrid: Single component, non-sag, high movement, ASTM C920 Type S, Grade NS, Class 50 Use NT, M, A and O.
 - a. Products: Provide one of the following:
 - 1) BASF: MasterSeal NP 150.
 - 2. Polyurethane: Single-component, non-sag, non-traffic use, ASTM C719, Type S, Grade NS, Class 100/50, Use NT, O, M, and A.
 - a. Products: Provide one of the following:
 - 1) Sika Corporation: Sikaflex 15 LM. Tremco Incorporated: Vulkem 921.

2.03 EXTERIOR BEDDING SEALANT AT HORIZONTAL AND VERTICAL JOINTS

- A. Bedding and Threshold Sealants Concealed from UV:
 - 1. Butyl Rubber: Single-component, Non-skinning Butyl Bedding Sealant; ASTM C1311
 - a. Products: Provide one of the following:
 - 1) Bostik: Chem-Calk 300.
 - 2) Pecora Corporation: BC-158.
 - 3) Tremco Incorporated: Tremco Butyl Sealant.

2.04 INTERIOR JOINT SEALANTS

- A. Exposed Joint Sealant: General Use.

1. Single Component, Nonsag, Paintable Siliconized Acrylic Latex Joint Sealant; ASTM C834.
 - a. Products: Provide one of the following:
 - 1) Dowsil 795 or 758.
 - 2) Tremco Incorporated: Tremflex 834.
 - 3) Pecora Corporation: AC-20.
 - 4) Momentive Performance Materials: RCS20 .

2.05 JOINT-SEALANT BACKING

- A. Joint Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; as approved in writing by joint-sealant manufacturer, for joint applications indicated based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 1. Products: Provide one of the following:
 - a. Backer Rod Manufacturing Inc.: Mile High Foam.
 - b. MBCC Group: MasterSeal 920.
 - c. Nomaco Engineered Foam Solutions: HBR Closed Cell Backer Rod.
 - d. W. R. Meadows, Inc.: Kool-Rod.
- C. Precompressed Foam Seals: Self expanding, polyurethane foam tape joint seal, size as appropriate for plus and minus 50 percent elongation and compression of joint.
 1. Products: Provide one of the following:
 - a. Emseal Joint System: Backerseal.
 - b. Schul Internation Company: Sealtite B.
 - c. Tremco Inc.: Illmod 600.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 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.

3.02 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 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), existing 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. Retain porous substrates in first four subparagraphs below if applicable. Insert additional items to suit Project.
 - b. Concrete.
 - c. 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.
- D. Deteriorated/Damaged Substrates: Prepare substrate surfaces according to sealant manufacturer's written instructions.
- E. Field Adhesion Test: Perform at least 3 sealant field adhesion tests for the first 1000 feet of installed sealant for each exterior sealant joint type.
 - 1. Subsequently perform 1 test for every 1000 feet or one test per floor, per elevation.
 - 2. Remove additional sealant and prepare substrate as required to provide neat repair joint to match the original, like-new condition.
 - 3. Performing 3 additional tests after a test fail.
 - 4. Coordinate Field Adhesion Test and Partial Mockup installations.
 - 5. Locations to be selected by Architect.

3.03 INSTALLATION

- 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 C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Seal interior joints to make watertight and exterior joints to make watertight and weathertight. Refer to requirements of individual Sections. Include:
 - 1. Exterior double weather seal consisting of pre-compressed foam sealant, backer rod and sealant around windows, doors, wall louvers, and other openings in walls.
 - 2. Exterior furring penetrations.
 - 3. Around windows, wall louvers, and other openings in walls.
 - 4. Joints between dissimilar materials.
 - 5. At joints in sheet metal, flashing, and trim.
 - 6. Expansion joints and control joints at masonry and concrete. Moving cracks and joints subject to movement, except where firestopping is required as specified Section 078400 - Firestopping.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- F. Install sealants using proven techniques that comply with the following and at 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.
- G. Install 2 beads of sealants to make watertight joints at flashing and other metal overlaps.
- H. Install 2 beads under metal thresholds support legs prior to setting in place.
- I. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants 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 C1193, unless otherwise indicated.

3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Conduct joint-sealant field-adhesion tests as required to meet manufacturer's extended warranty requirements and as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory.
1. 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.
- C. Quality of Work Corrections: Correct deficiencies and present remediation plan to address deficiencies if Architect, Building Envelope Consultant, Consultant's Monitor, Owner's Project Manager or Manufacturer determine that the quality of Work does not align with Specifications, Drawings, and/or Manufacturer's published requirements, industry standards.
- 3.05 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as Work progresses.
1. Clean per manufacturers instructions.
- B. Clean entire facade where sealants show dirt.
1. If joint sealants show dirt 10 months after Final Completion, clean joint sealants over entire facade.
- 3.06 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other cause.
1. If damage/deterioration occurs, cut out and remove damaged/deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original Work.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
1. Exterior steel doors and frames.

1.02 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to SDI A250.8.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate installation of anchorages 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.
 2. Coordinate requirements for installation of door hardware and strike box placement and depth.
 3. Doors to arrive on-site without door hardware installed.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, and fire-resistance ratings.
 2. Include type of coating system, DTF of each coat, product physical properties, accelerated test data and pretreatment data.
 3. Include wind-load calculation compliance.
- B. Shop Drawings: Include the following:
1. Elevations of each door and frame type.
 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Wind load zones.

- C. Product Schedule: For hollow-metal doors and frames, prepared by or under supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.05 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, fire-rated borrowed lite assembly, and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.
- B. Paint Compatibility Certificates: From manufacturers of shop-primer certifying that field-painted topcoat system is compatible.

1.06 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum of 10 years in the manufacturing of hollow metal doors and shop-applied primer of similar type.
 - 1. Steel Door Institute (SDI) certified Manufacturer capable of fabricating hollow metal doors, frames, and relites that meet or exceed performance requirements indicated, and of documenting this performance by test reports and calculations. Coordinate shop primers and field finish to achieve system compatibility. Provide factory Manufacturer's recommended primer for acceptable field finish of the system.
- B. Installer Qualifications: Installer shall have a minimum of 5 years of experience installing systems similar to those specified in this section and shall provide proof of such. Representative projects shall be of similar or larger scale.
- C. Shop-Applied Primer Applicator Qualifications:
 - 1. Applicator regularly engaged in application of shop-applied coating systems of similar type to that specified.
 - 2. Employ persons trained for application of shop-applied coating systems.
 - 3. Approved by manufacturer.
 - 4. Equipped, trained, and approved for application of shop-applied coating systems required for this Project.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.

- B. Deliver welded frames with 2 removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following:
 - 1. Baron Metal Industries, Inc; an Assa Abloy Group company.
 - 2. De La Fontaine Inc.
 - 3. EFCO Corp.
 - 4. Pioneer Industries, Inc.
 - 5. Steelcraft, a Allegion Brand.
- B. Source Limitations: Obtain hollow-metal Work from single source from single manufacturer.

2.02 PERFORMANCE CRITERIA

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Thermally Rated Exterior Opaque Door Assemblies when tested according to ASTM C1363:
 - 1. U-Factor of 0.37 for swing doors and 0.34 for non-swinging doors or less.
- C. Wind-Loads: Comply with wind loads as indicated on Drawings.
 - 1. Corner and Field Zones: As indicated on Drawings.

2.03 EXTERIOR STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 4; SDI A250.4, Level A.
 - 1. Doors:

- a. Thickness: 1 3/4 inches.
 - b. Face: Galvannealed steel sheet; ASTM A653/ A653M, minimum 0.0647 inch thick.
 - 1) Exterior Facing: A90.
 - 2) Interior Facing: A60.
 - c. Internal Reinforcement: Metallic-coated steel sheet, minimum 0.040 inch thick Z-Section, 6 inches on center.
 - d. Edge Construction: Model 2, seamless.
 - e. Edge Profile: Provide manufacturer's standard beveled edges; provide square edge when requires for off-set/swing clear hinge.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets.
 - h. Core: Polyurethane insulation.
 - i. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.
2. Frames: Flush-mount-type; SDI A250.8, Level 4.
 - a. Material: Galvannealed steel sheet with A60 coating, minimum 0.0647 inch thick.
 - b. Type: Thermally Broken and as indicated in the Door and Frame Schedule.
 - c. Construction: Full-profile welded; knock-down frames not accepted..
 3. Finish: Shop-prime; top coat as indicated on Drawings.
 4. Accessories:
 - a. Rain Guard: Provide rain guards/caps of same material as frame at exterior out-swinging doors, unless under protective awnings or soffits.

2.04 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of 3 anchors per jamb, with 1 additional anchor for frames with no floor anchor. Provide 1 additional anchor for each 24 inches of frame height above 7 feet.
 3. Postinstalled Expansion Anchor: Minimum 3/8 inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011; hot-dip galvanized according to ASTM A153, Class B.
- D. Number and Spacing:

1. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches on center.

2.05 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus 1/2 of preconsumer recycled content not less than 75 percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153.
- 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. Foamed-in-Place Insulation: Manufacturer's standard, closed cell, spray-applied polyurethane type.
- H. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool.
 1. Surface Burning Characteristics: Passes when tested according to ASTM E136 for combustion characteristics
 - a. Flame Spread: 25.
 - b. Smoke Developed: 50.
- I. Metal Patching Compound: Metal-filled, 2-component epoxy putty designed for use on various metal substrates.

2.06 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. Reinforcement: 1-piece steel channels continuously welded full length to face sheets.
 - a. Lock Channel: 0.067 inch thick steel, beveled 1/8 inch in 2 inch.
 - b. Hinges: Provide the following:

- 1) Thermally Broken Doors: Continuous hinges running full door height formed and tapered; 0.093 inch thick steel extruded to 7 gauge.
 - c. Top and Bottom Channels: 0.053 inch thick steel with flush channel filler cap to close top rail opening.
 2. Snap-in caps not accepted.
 3. Provide weep-hole bottoms openings of exterior doors to permit moisture to escape.
 4. Closer Reinforcement Channel: 0.093 inch thick steel.
 5. Exterior and Insulated Doors: 0.042 inch thick vertical steel-stiffener welded in-place at 6 inches on center; filled with manufacturer's standard foamed-in-place polyurethane; faces chemically bonded to face sheets.
 - 1) Kraft paper honeycomb cores are not acceptable.
- C. Hollow-Metal Frames: Fabricate in 1 piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Thermal Breaks: Fabricate frames with minimum 1/16 inch positive thermal break and integral weatherstripping to meet specified door assembly U-values.
 - a. Weatherstripping to meet ASTM E2203.
 3. Faces: 2 inch and 1 1/4 inch for fire rated frames
 4. Rabbits: Double 5/8 inch unless indicated otherwise.
 5. Backbends:
 - a. Butted Frames: Custom 1 1/2 inch minimum backbends.
- D. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; 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 BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- 2.07 STEEL FINISHES
- A. Shop-Prime: Inorganic, polyamide epoxy, zinc-rich primer.
1. Dry Film Thickness: Minimum 3 to 3.5 mils per coat.
 2. Galvanic Protection: Average measured potential of zinc primer 878 mille-volts.
 3. Adhesion: ASTM D4541 Type V positester; not less than 2,083 psi.
 4. VOC: Less than 250 g/L.
- B. Intermediate and topcoat system specified in Section 099000 - Painting and Coating.

PART 3 - EXECUTION

3.01 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Install frames with removable stops located on secure side of opening.
 - 2. Exterior Frames: After installation of frames, fill frame cavities with foamed-in-place insulation. Install backer rod and sealant.
 - 3. Fire-Rated Openings: Install frames according to NFPA 80.
 - 4. Floor Anchors: 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.
 - 5. 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.
 - 6. Installation Tolerances: Adjust hollow-metal frames 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 and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Install hardware after finishing door; if hardware installed prior to shipping, remove hardware at site to finish doors.

3.03 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.04 CLEANING AND TOUCHUP

- A. 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.
- B. Touchup Painting: Cleaning and touchup painting as specified in Section 099000 - Painting and Coating.

END OF SECTION

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Aluminum windows for exterior locations.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct meeting at Project. Review and discuss methods and procedures related to glazed aluminum curtain walls, including the following:

1. Timing: Schedule meeting a minimum of 4 weeks prior to starting Work of this Section.
2. Attendees: Architect, Owner, Contractor, Installer, manufacturer's representative, envelope consultant, and other entities whose Work is related to this Section.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and discuss finishing of aluminum windows that is required to be coordinated with finishing of other aluminum Work for color and finish matching.
5. Review, discuss, and coordinate interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
6. Review and discuss sequence of Work required to construct a watertight and weathertight exterior building envelope.
7. Inspect and discuss condition of substrate and other preparatory Work performed by other trades.

B. Manufacturer's Field Services:

1. Attend preinstallation conference. Make initial, intermittent, and final field observations for installation Work of this Section.
2. Monitor installation procedures and report conditions not conforming to manufacturer instructions or provisions of Contract Documents to Contractor. Copy report to Owner and Architect.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
2. Include type of coating system, DTF or each coat, product physical properties, accelerated test data and pre-treatment data.

- B. Shop Drawings: For aluminum windows.
 - 1. Include plans, elevations, sections, hardware, accessories, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Schedule: For aluminum windows, use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Manufacturer and Installer.
- 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 each type of aluminum window, for tests performed by a qualified testing agency.
- D. Certification of ASHRAE 90.1 Fenestration Rating.
- E. Sample Warranties: For manufacturer's warranties.
- F. Coating Applicator Qualification: Provide coating applicator certification.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For windows to include in maintenance manuals.
- B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer that specializes in manufacturing aluminum windows comparable to systems specified for this Project with a minimum of 10 years of documented experience.
 - 1. Minimum of 10 years in the manufacturing of shop-applied coating systems of similar type.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer with a minimum of 10 years of documented experience installing aluminum windows comparable to systems specified of this Project.
- C. Coating Applicator Qualifications:

1. Applicator regularly engaged in application of shop-applied coating systems of similar type to that specified.
 2. Employ persons trained for application of shop-applied coating systems.
 3. Approved by manufacturer.
 4. Equipped, trained, and approved for application of shop-applied coating systems required for this Project.
 5. Approved to provide warranty specified in this Section.
 6. Certified Fluropone Pure Applicator.
- D. Mockups: Build Partial Mockup per Section 014339 - Mockups to demonstrate aesthetic effects, and to set quality standards for materials and execution.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Water penetration through fixed glazing and framing areas.
 - f. Failure of operating components.
 - g. Failure of insulating glass.
 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 20 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes the following:
 - a. Color fading more than 5 Hunter units when tested per ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested per ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.
- C. Installer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 1. Failures include the following:
 - a. Structural failures including excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Water penetration through fixed glazing and framing areas.
 - d. Failure of operating components.
 2. Warranty Period: 5 years from date of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this Section in accordance with AAMA CW-10.
- B. Protect finished fiberglass surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to fiberglass when exposed to sunlight or weather.
- C. Protect from damage during storage and subsequent handling during installation.

1.09 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.02 PERFORMANCE CRITERIA

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 1. Minimum Performance Class: CW.
 2. Minimum Performance Grade: 40.

- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/square feet
- D. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 61 (Frame) and 65 (Glass).
- E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.
- F. Air Infiltration: Test according to ASTM E283 for infiltration as follows:
 - 1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/square feet at a static-air-pressure differential of 10 lbf/square feet velocity, but not less than 10 seconds
- G. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined per NFRC 200.
- H. Water Penetration Performance Requirements:
 - 1. Static Pressure, ASTM E331: No uncontrolled water penetration when tested under static-air-pressure differential of 15 lbf/square feet, with water application rate of 5 gal/hr./square feet
- I. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 degree F. ambient; 180 degree F. material surfaces.
- J. 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. 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.
- K. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.

- L. Seismic Performance: Aluminum windows shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

2.03 ALUMINUM WINDOWS

- A. Basis of Design: Provide Series AA4325 Ultra Thermal Windows - Fixed by Kawneer Company Inc. or approved substitution from one of the following:
 - 1. Arcadia, Inc.
 - 2. Oldcastle BuildingEnvelope: Signature.
 - 3. Tubelite, Inc.: 3700 Series.
- B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Thermally Improved Construction: Fabricate frames with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- C. Glass and Glazing Materials: as specified in Section 088000 - Glazing.
- D. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.04 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Interior and Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- C. Receptor System: 2-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.
- D. Flashing:
 - 1. Exposed: 0.032 inch thick aluminum sheet; ASTM B209, finish to match framing members.
 - 2. Concealed: Dead-soft, 0.018 inch thick stainless steel, ASTM A240 of type recommended by manufacturer.

2.05 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

- B. Glaze aluminum windows in factory.
- C. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. Complete fabrication, assembly, finishing, hardware application, and other Work in factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.06 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" 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.

2.07 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by Aluminum Association for designating aluminum finishes.
- B. High-Performance Liquid Fluoropolymer Paint (PVDF): AAMA 2605-17; at least 70 percent PVDF resin by weight in color coat; 2-coat system.
 - 1. Basis of Design: Provide Fluropon Pure by Sherwin Williams or accepted equal:
 - a. Color Retention: Less than 5 Delta E in 10 years.
 - b. Pre-Treat: Minimum 40 mg/ square foot chrome.
 - c. Prohesion: ASTM G85 Annex A5, at least 2,000 hours.
 - d. Humidity Testing: ASTM D2247, at least 4,000 hours.
 - e. Color: Custom as selected by Architect from paint industry's full range.
- C. Liquid Strippable Coating: Apply in shop to prefinished surfaces to protect finish during fabrication, shipping, and field-handling.

2.08 REGULATORY REQUIREMENTS

- A. Fenestration Product Rating:
 - 1. Provide U-factors for each fenestration product in accordance with NFRC 100 and accredited, by an independent laboratory for all exterior fenestrations.
 - 2. Provide labeling and certification by the manufacturer for SHGC, VT and leakage rating.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- E. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- F. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- G. Install sill flashings. Turn up ends and edges; seal to adjacent Work to form water tight dam.
- H. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- I. Coordinate attachment and continuity of seal of perimeter air and vapor barrier materials.
- J. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- K. Install glazing as specified in Section 088000 - Glazing.
- L. Install perimeter sealant in accordance with Section 079200 - Joint Sealants.

1. Ensure substrates are clean, dry, and of sufficient size for the proper bond and performance of sealant.
 2. Double Weather Seal: Apply sealants, backer rods and precompressed foam for water and weather tight installation, at joints, intersections, and perimeters to surrounding construction.
 3. Interior Air/Moisture Seal: Ensure interior perimeter of fenestration assemblies have continuous and complete air seals. The complete interior air seal is critical for water penetration resistance.
- M. Seal frames to surrounding construction. Remove excess materials as work proceeds to leave exposed surfaces and joints clean and smooth.
- N. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- O. Protect finished surfaces as necessary to prevent damage during progress of Work.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified, independent testing agency to perform testing indicated. Inspection includes monitoring quality of installation and glazing.
1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.
1. Pay for corrective Work and retesting with no additional cost to Owner, including testing fees and Architect and consultant fees.
- C. Prepare test and inspection reports.

3.04 ADJUSTING AND CLEANING

- A. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
1. Keep protective films and coverings in place until final cleaning.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.05 PROTECTION

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 086200 - SKYLIGHTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Unit skylights mounted on site-erected curbs.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Motors: Show nameplate data, power requirements, ratings, characteristics, and mounting arrangements.
- B. Aluminum Finish Samples: For each type of exposed finish required, in a representative section of each unit skylight in manufacturer's standard size.
- C. Fabrication Sample: Of each framing 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.
- D. Product Schedule: For skylights. Use same designations indicated on Drawings.

1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
 - 1. Provide current NFRC certification for manufacturer.
- B. Compatibility and Adhesion Test Reports: For structural-sealant-glazed skylights, test reports from sealant manufacturer indicating that joint sealants have been tested for each material that will come in contact with sealants.
- C. Sample Warranties: For special warranties.
- D. Product Test Reports: For each type and size of unit skylight, for tests performed within the last four years by a qualified testing agency. Test results based on testing of smaller unit skylights than specified will not be accepted.

- E. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For skylights to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of metal-framed skylights required for this Project.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- C. Coating Applicator Qualifications:
 - 1. Applicator regularly engaged in application of shop-applied coating systems of similar type to that specified.
 - 2. Employ persons trained for application of shop-applied coating systems.
 - 3. Approved by manufacturer.
 - 4. Equipped, trained, and approved for application of shop-applied coating systems required for this Project.
 - 5. Approved to provide warranty specified in this Section.

1.06 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of metal framed skylights that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Structural failures including excessive deflection.
 - b. Uncontrolled water leakage.
 - c. Noise or vibration caused by thermal movements.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - e. Adhesive or cohesive sealant failures.
 - f. Water leakage.
 - g. Yellowing of acrylic glazing.
 - h. Deterioration of insulating-glass hermetic seal.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Aluminum-Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Failures include checking, crazing, peeling, chalking, and fading of finishes.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following NFRC certified manufacturers:
 1. CPI Daylighting.
 2. Crystalite, Inc.
 3. DeaMor.
 4. Kalwall Corp.
 5. Kingspan Light and Air, LLC.
 6. Oldcastle Building Envelope.
 7. Suntopics.
 8. Accepted substitution.

2.02 PERFORMANCE CRITERIA

- A. Unit Skylight Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Performance Class and Grade: Class CW-PG 40.
 2. Certification: AAMA-, WDMA-, or CSA-certified unit skylights with label attached to each.

2.03 UNIT SKYLIGHTS

- A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.
- B. Unit Shape and Size: To match existing, as indicated on Drawings. Field verify size.
- C. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).
 1. Double-Glazing Profile: Dome, 25 percent rise .
 - a. Thicknesses: Not less than thicknesses required to exceed performance requirements.
 - b. Outer Glazing Color: Colorless, transparent.
 - c. Inner Glazing Color: White, translucent.
 2. Self-Ignition Temperature: 650 degree F or more for plastic sheets in thickness indicated when tested according to ASTM D 1929.
 3. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E 84, and smoke density of 75 or less when tested according to ASTM D 2843

4. Burning Characteristics: Tested according to ASTM D 635. Class CC2, burning rate of 2 1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use.
- D. Glazing Gaskets: Manufacturer's standard neoprene, partially vulcanized butyl tape, or liquid-applied elastomeric sealant.
- E. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.
- F. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.
- G. Guardrail: Provide curb mounted guardrail fall protection system, top rail 42" above roof surface. See Section 077200 - Roof Accessories.

2.04 FABRICATION

- A. Fabricate aluminum 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. Internal guttering systems or other means to drain water passing joints and moisture migrating within skylight to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
- B. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
- C. Reinforce aluminum components as required to receive fastener threads.
- D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- E. Pre-tab and shop weld or solder the flashing prior to finishing.

2.05 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by Aluminum Association for designating aluminum finishes.
- B. Clear Anodized Finish: AAMA 611-12, AA-M12C22A41, Class I, acid etch process.
- C. Liquid Strippable Coating: Apply in shop to prefinished surfaces to protect finish during fabrication, shipping, and field-handling.

2.06 ACCESSORIES

- A. Curb Mounted Fall Protection Guardrail: Comply with 2017 Occupational Safety and Health Standards 1910.29 Regulation. Provide manufacturer's standard Cal-OSHA compliant surround-railing and compliant with 29 CFR Part 1926.
 - 1. Material: Galvanized steel or aluminum.
 - 2. Integral.
- B. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.
 - 1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

PART 3 - EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
 - 1. Do not install damaged components.
 - 2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 - 3. Rigidly secure nonmovement joints.
 - 4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 5. Seal joints watertight unless otherwise indicated.
- B. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with protective coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, and moisture migrating within skylight to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.

- F. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:
 - 1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
 - 2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet but no greater than 1/2 inch over total length.

3.03 INSTALLATION, UNIT SKYLIGHTS

- A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
- B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.
- C. Install unit skylights level, plumb, and true to line, without distortion.
- D. Anchor unit skylights securely to supporting substrates.
- E. Where aluminum surfaces of unit skylights will contact another metal or corrosive substrates, such as preservative-treated wood, apply bituminous coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by unit skylight manufacturer.
- F. Anchor guardrail securely to curb in a watertight fashion, do not interfere with flashing.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, skylights shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - 2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E1105.
 - a. Test Procedures: Test under uniform and cyclic static-air pressure.
 - b. Static-Air-Pressure Difference: 15 lbf/ square feet.
 - c. Water Penetration: None.
- B. After completion of installation and nominal curing of sealant and glazing compounds but before installation of interior finishes, test for water leaks according to AAMA 501.2.
- C. Repair or remove Work where test results and inspections indicate that it does not comply with specified requirements.

- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Prepare test and inspection reports.

3.05 CLEANING AND PROTECTION

- A. Clean exposed surfaces immediately after installing skylights. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- B. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Remove and replace plastic glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect skylights from contact with contaminating substances resulting from construction operations. If contaminating substances do contact skylight surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Glass for:
 - a. Windows.
 - 2. Sealants and accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- B. Preinstallation Meetings: Conduct meeting at Project.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.03 ACTION SUBMITTALS

- A. Product Data: Submit for each product.
- B. Glass Samples: For each type of glazing product other than clear monolithic vision glazing:
 - 1. Size: Not less than 8 inch square.
- C. Glazing Schedule: List glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installers and manufacturers of insulated glazing units units with sputter-coated, low-e coatings.
- B. Product Certificates: For glass and glazing products.
- C. Product Test Reports: For coated glass and insulated glazing units, and tinted glass for tests performed by a qualified testing agency.

- D. Sample Warranties: For special warranties.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating Glazing Units with Sputter-Coated, Low-E Coatings: Insulating glazing manufacturer who is approved and certified by coated glass manufacturer.
- B. Installer Qualifications: Qualified installer who employs glazing installers who are certified under National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: Qualified independent testing agency accredited per NFRC CAP 1 Certification Agency Program.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials per 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 insulated glazing manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.07 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.

1.08 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 glazing is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glazing contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer agrees to replace insulated glazing units that deteriorate within specified warranty period. Deterioration of insulated glazing is defined as failure of hermetic seal under normal use that is not attributed to glazing breakage or to maintaining and cleaning insulated glazing contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Glazing Manufacturers:

1. Cardinal Glass Industries.
2. Guardian Glass.
3. Pilkington North America.
4. Vitro Architectural Glass.
5. Viracon.

B. Glazing Fabricators:

1. Northwestern Industries.
2. Viracon, Inc.

C. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.02 PERFORMANCE CRITERIA

A. Recycled Content: Glass to have a minimum of 25 percent recycled content.

B. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads without failure, including loss or glass breakage attributable to the following:

1. Defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300:

1. Design Wind Pressures: As indicated on Structural Drawings.
2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass windows.

D. Thermal and Optical Performance Properties: Provide glazing with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, per NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/square feet by height by degree F.
2. Solar Heat Gain Coefficient and Visible Transmittance: Center of glazing values, per NFRC 200 and based on LBL's WINDOW 5.2 computer program.

3. Visible Reflectance: Center of glazing values, per NFRC 300.

2.03 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glazing product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: Glazing Manual.
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Insulating Glass Certification Program: Permanently marked either on spacers or on at least 1 component lite of units with appropriate certification label of IgCC.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- D. Products should be fabricated to be installed with glazing tape.

2.04 SAFETY GLAZING, GENERAL

- A. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of CPSC 16 CFR 1201, Category II or another certification agency acceptable to authorities having jurisdiction, or manufacturer.
 1. Label shall indicate manufacturer's name, type of glazing, thickness, and safety glazing standard with which glazing complies.
 2. Label may be acid etched, sandblasted, ceramic fired laser etched, or embossed.
 3. Locate label in upper right hand corner as viewable from exterior.
- B. Products should be fabricated to be installed with glazing tape.

2.05 GLASS PRODUCTS

- A. Fully-Tempered, Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.

2.06 CERAMIC-COATED GLASS

- A. Ceramic-Coated Vision Glass (IGU-1): ASTM C1048, Type I, Condition B, Quality-Q3, complying with specified requirements.
 1. Basis of Design: Provide Viracon or accepted equal:
 - a. Berkowitz, JE, LP.

- b. Oldcastle BuildingEnvelope.
 - c. Approved substitution.
- 2. Glass: Fully-tempered.
 - 3. Thickness: 6mm.
 - 4. Glass type: Monolithic.
 - 5. Tinting:
 - a. Outboard Lite: Optigray.
 - 6. Inboard Lite: Clear.
 - 7. Ceramic Coating Color and Pattern: Translucent, as selected by Architect from manufacturer's full range.
 - 8. Ceramic Coating Location: Second surface.

2.07 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from silicone-compatible material complying with ASTM C864.
- B. Soft Compression Gaskets: Manufacturer's extruded or molded, closed-cell, integral-skinned EPDM or silicone gaskets complying with ASTM C509, 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.

2.08 GLAZING TAPES

- A. Mastic Glazing Tapes: Preformed, pre-shimmed, 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 C1281 and AAMA 800

2.09 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Silicone-compatible material with a Shore A durometer hardness of 85, plus or minus 5.
 - 1. Type recommended by sealant or glazing manufacturer.
- D. Spacers: Blocks or continuous extrusions of silicone-compatible material, of hardness required by glazing manufacturer to maintain glass windows in place for installation indicated.

- E. Edge Blocks: Silicone-compatible material with a Shore A durometer hardness required by glazing manufacturer to maintain glass windows in place for installation indicated.
 - 1. Type recommended by sealant or glazing manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glazing framing members and glazing components.
 - a. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glazing framing members.
 - 5. Chips, dings, cloudiness or defects in sheets of glass. If defect present, replace.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in completed Work.

3.03 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glazing, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glazing edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glazing manufacturers for installing glass windows.
- F. Provide spacers for glass windows 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.
- G. Provide edge blocking where indicated or needed to prevent glazing windows from moving sideways in glazing channel, as recommended in writing by glazing manufacturer.
- H. Set glazing windows in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glazing windows with proper orientation so that coatings face exterior or interior as specified.
- J. 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.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glazing, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Center glazing windows 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.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 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 glazing 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 windows 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 glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure Glazing Stops: Center glazing windows 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 glazing. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.06 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect exterior glazing from damage immediately after installation by attaching crossed streamers to framing held away from glazing. Do not apply markers to glazing surface.
- C. Protect glazing from contact with contaminating substances resulting from construction operations. Examine glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If contaminating substances do come into contact with glazing, remove substances immediately as recommended in writing by glazing manufacturer. Remove and replace glazing that cannot be cleaned without damage to coatings.
- D. Remove and replace glazing that is damaged during construction period.
- E. Wash glazing on both exposed surfaces not more than 4 days before date scheduled for inspections that establish date of Substantial Completion. Wash glazing as recommended in writing by glazing manufacturer.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Non-load-bearing steel framing systems for interior partitions.
 2. Grid suspension systems for gypsum board ceilings.
 3. Suspension systems for interior ceilings and soffits.

1.02 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Provide certification for studs, hat-channels and tracks complying with ASTM C645 and AISI S220 standards.
- B. Manufacturer's Certification: Submit manufacturer's certification of product compliance with codes and standards along with product literature and data sheets for specified products.

1.03 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to product-certification program of Certified Steel Stud Association (CSSA), Steel Framing Industry Association (SFIA), or Steel Stud Manufacturers Association (SSMA).
- B. Contractor shall provide effective, full-time quality control over all fabrication and erection complying with pertinent codes and regulations of government agencies having jurisdiction. Conduct preinstallation meeting to verify Project requirements, substrate conditions, and manufacturer's written installation instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Notify manufacturer of damaged materials received prior to installation.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling required by AISI S202 "Code of Standard Practice."

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Horizontal Deflection Requirements: Based on horizontal loading of 5 pounds per square foot.
 - 1. Non-Tiled Walls: $L/240$ of wall height.

2.02 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus 1/2 of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with AISI S220 and ASTM C645, Section 10 for conditions indicated.
 - 1. Steel Sheet Components: Comply with AISI S220 and ASTM C645, Section 10 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A645, hot-dip galvanized. A40 Galvanealed is not acceptable.
 - a. Interior Walls: G40.
 - 3. Minimum Base-Metal Thickness: 20 gauge.
 - a. Provide heavier steel studs where greater design loads are indicated or required conforming to metal framing manufacturer's published load tables.
 - b. Flange: Minimum 1 1/4 inch.
 - c. Returns: 90 degrees unless detailed otherwise.
 - d. Depth: As indicated on Drawings.
 - 4. Webs: Punched for mounting electrical conduit and channel reinforcement except for header and jamb framing.
- C. Studs and Tracks: AISI S220 and ASTM C645, Section 10. Use C-shaped steel studs and tracks.
 - 1. Manufacturers: Provide products from one of the following:
 - a. CEMCO; California Expanded Metals Co.
 - b. ClarkDietrich Building Systems, LLC.
 - c. SCAFCO Corporation.
 - d. Steeler Inc.
 - e. The Steel Network, Inc.
- D. Hat-Shaped, Rigid Furring Channels: AISI S220 and ASTM C645, Section 10.
 - 1. Products: Provide one of the following:
 - a. ClarkDietrich Building Systems: Furring Channel.
 - b. SCAFCO Steel Stud Company: SCAFCO: (Hat) Furring Channel.

- c. Steeler Inc.: F-Members.
 2. Minimum Base-Metal Thickness: 20 gauge.
 3. Depth: 7/8 inch unless indicated otherwise on Drawings.
- 2.03 SUSPENSION SYSTEMS
- A. Contractor's option below for furred ceiling or soffits.
 - B. Furring Channels (Furring Members):
 1. Cold-Rolled Channels: 0.053 inch uncoated-steel thickness, with minimum 1/2 inch wide flanges, 3/4 inch deep.
 2. Steel Studs and Runners: AISI S220 and ASTM C645, Section 10.
 - a. Minimum Base-Metal Thickness: 20 gauge.
 3. Hat-Shaped, Rigid Furring Channels: AISI S220 and ASTM C645, Section 10, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.018 inch.
 4. Resilient Furring Channels: 1/2 inch deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
 - b. Locations: As indicated on ceiling type Drawings.
 - C. Grid Suspension System for Gypsum Board Ceilings: AISI S220 and ASTM C645, Section 10, direct-hung system composed of main beams and cross-furring members that interlock, complying with the following. Provide fire-rated components where indicated on Drawings to comply with appropriate building codes.
 1. Products: Provide one of the following:
 - a. Armstrong World Industries, Inc.: Drywall Grid Systems.
 - b. Rockfon: 640/660 Drywall Ceiling Suspension.
 - c. USG Corporation: Drywall Suspension System.
 2. Main Beam: Minimum 0.0179 inch thick commercial grade steel, double-web construction, hot dipped galvanized per ASTM A653, 1-3/8 to 1 1/2 inch wide knurled face by 1 1/2 inches high by 144 inches long, with factory punched cross tee slots, hanger holes, and non-directional bayonet end tab couplings.
 3. Primary Cross Tees: Minimum 0.0179 inch thick commercial grade steel, double-web construction, hot dipped galvanized per ASTM A653, 1 1/2 inch wide knurled flange by 1 1/2 inches high.
 4. Secondary Framing Cross Tees: Minimum 0.0179 inch thick commercial grade steel, double-web construction, 15/16 inch wide flange by 1 1/2 inches high.
 5. Wall Track: Minimum 0.0179 inch thick commercial grade steel, double-web construction, 15/16 inch wide flange by minimum 1 1/2 inches high.
 6. Wall Moldings: Single web with knurled face.

7. Accessories: Provide clips, compression posts, wire, fasteners, and other components for a complete system.

2.04 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including wall partitions, 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.

3.02 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with 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 Work and that hangers will develop their full strength.
 1. Furnish devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.03 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 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, unless otherwise indicated.
 - 1. Single-Layer Application: 16 inches on center.
 - 2. Multilayer Application: 16 inches on center.
- B. Install studs so flanges within framing system point in same direction.
- C. 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.

3.05 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install ceiling suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches on center.
 - 2. Carrying Channels (Main Runners): 48 inches on center.
 - 3. Furring Channels (Furring Members): 16 inches on center unless indicated otherwise.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. 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 connect or suspend steel framing from ducts, pipes, or conduit.

- D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- E. 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.
- F. 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

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board panels.

1.02 PRICE AND PAYMENT PROCEDURES

A. Unit Prices:

1. See Section 012200 - Unit Prices for description of unit prices affecting items specified under this section.

1.03 ACTION SUBMITTALS

- A. Product Data: Provide published product data specified products.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 3 years of documented experience.
- B. Mockups: Provide Partial Mockups as specified in Section 014339 - Mockups.
1. Provide Partial Mockup of finish Level 5 prior to receiving final finish.
 2. Provide final illumination or recreate lighting angles and foot candles prior to mockup approval.

1.05 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.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Fire Rated Gypsum Board:
 - 1. Install at walls and ceilings that do not receive flexible gypsum board, abuse/ impact-resistant gypsum board, moisture and mold-resistant gypsum board or any other specialty gypsum board.

2.02 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396; surfaced with 100 percent recycled content paper on front, back, and long edges.
 - 1. Products: Provide one of the following:
 - a. CertainTeed Corporation: Type X or GlasRoc.
 - b. Georgia-Pacific Gypsum LLC: ToughRock Fireguard X.
 - c. USG Corporation: USG Sheetrock Brand Firecode X or EcoSmart Panels.
 - d. Approved substitution.
 - 2. Thickness: Match existing, and as indicated on Drawings.
 - 3. Edges: Tapered and featured (rounded or beveled) for prefilling.

2.03 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Paper-faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.

- B. Expansion (Control) Joints: Paper-faced galvanized steel sheet control joint with 1/2 inch to 3/4 inch grounds for drywall finishes. Staple or screw grounds to panel face.
 - 1. Manufacturers: Provide products by one of the following:
 - a. Alabama Metal Industries Corporation (AMICO).
 - b. Armstrong World Industries, Inc.
 - c. Fry Reglet Corporation.
 - d. Gordon Interior Specialties Division, Gordon, Inc.
 - e. USG Corporation.
 - f. CEMCO Steel
 - g. Approved substitution.

2.04 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- 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, beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: or embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use 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.

2.05 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install panels at ceilings perpendicular to framing to minimize 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 1 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. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical and horizontal surfaces unless indicated otherwise, including fire-resistance-rated assemblies and ceiling surfaces.
- 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. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.04 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 per manufacturer's written instructions.
- B. Control (Expansion) Joints: Install control joints per ASTM C840, and in specific locations approved by Architect for visual effect.
 - 1. Minimum Control Joint Spacing: 30 feet on center each way.
 - 2. Minimum Joint Spacing Between Panels: 1/4 inch.
 - 3. Provide continuous framing or backing behind both flanges of joint material.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. U-Bead: Use at exposed panel edges or where indicated.

3.05 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 those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, per ASTM C840, for locations indicated:
 - 1. Level 1: Provide Level 1 finish at the following conditions:
 - a. Use above suspended ceilings and within other concealed spaces where gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or space serves as an air plenum.
 - 2. Level 4: Provide Level 4 finish at the following conditions:
 - a. Where indicated as exposed to view and flat finish coat, unless otherwise indicated.
 - b. Where indicated for light-textured-finish wall covering and heavy wall covering.
 - 3. Primer: Refer to Section 099000 - Painting and Coating.

3.06 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095113 - ACOUSTICAL CEILING PANEL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Acoustical panels.
 2. Metal suspension systems.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices:
1. See Section 012200 - Unit Prices for description of unit prices affecting items specified under this section.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate removal, layout and re-installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.04 ACTION SUBMITTALS

- A. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. Acoustical tile and panel: Two sets of 6 inch square Samples of each type, color, pattern, and texture.
 2. Exposed Suspension-System Members, Moldings, and Trim: Two sets of 6 inch long Samples of each type, finish, and color.
- B. 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. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Sensors and alarm equipment.

f. Signage.

1.05 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by qualified testing agency.
- B. Evaluation Reports: For each acoustical ceiling suspension system and anchor and fastener type, from ICC-ES.
- C. Delegated Design Submittal: For design of seismic restraints, attachment devices and detail fabrication and assembly for suspended metal grid to comply with performance requirements and design criteria.
 - 1. Show anchorage detail fabrication and attachment; Indicate quantity, diameter, and depth of penetration of anchors.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to be included in maintenance manuals.

1.07 MAINTENANCE MATERIAL

- A. Furnish extra materials that match products installed and are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Tiles and Panels: Full-size panels equal to 5 percent of each quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 5 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm that specializes in manufacturing of specified acoustical ceiling systems and has been in standard production for a minimum of 3 years.
- B. Installer Qualifications: Company specializing in installing specified acoustical ceiling systems with a minimum of 3 years of documented experience and, authorized and certified by manufacturer to install manufacturer's systems.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling materials, suspension-system components, and accessories to Project site in original, unopened packages and store in 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 ceiling, permit to reach room temperature and stabilized moisture content.
- C. Handle acoustical panels and tiles carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical 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 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 ceiling installation.
 - 2. Do not install acoustical ceilings until after carpeting, paint and other interior materials that off-gas have been installed and odors and VOC fumes have dissipated.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of acoustical ceiling system that fail in materials or workmanship within specified warranty period. Warranty is for systems that include both manufacturer's acoustical ceilings and suspension systems.
 - 1. Failures include the following:
 - a. Acoustical Panels and Tiles: Visible sagging, warping, shrinking, buckling, or delamination.
 - b. Suspension System: Incurring of more than 50 percent red rust as defined by ASTM B117.
 - 2. Warranty Periods:
 - a. Acoustical Panels and Tiles: 10 years from date of Substantial Completion.
 - b. Suspension System: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling component and its supporting suspension system from single source, from single manufacturer.

2.02 PERFORMANCE CRITERIA

- A. Recycled Content: Ceiling products shall have recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer recycled content constitutes at least 20 percent of the total cost of the materials in the Project.

- B. Low-Emitting: Ceiling products shall comply with requirements of 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. Delegated Design: Engage manufacturer to design detail fabrication and assembly of suspended metal grid and seismic anchorage through a rational engineering analysis.
- D. Seismic Performance: Acoustical ceiling shall withstand effects of earthquake motions determined per ASCE/SEI 7.
 - 1. Zones: 3 and 4.
 - 2. Seismic Categories: D, E, and F.
- E. Surface-Burning Characteristics: Class A according to ASTM E84; testing by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- F. Fire-Resistance Ratings: Comply with ASTM E119; testing by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL or from listings of another qualified testing agency.

2.03 ACOUSTICAL CEILING, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance 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 per ASTM E795.
- B. Manufacturers: Provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.

2.04 ACOUSTICAL CEILING PANEL (ACP)

- A. Acoustical Ceiling Panel (ACP-1): Sound-Absorbing Impact & Humidity Resistant Ceiling Panel.
 - 1. Basis of Design: Armstrong Fine Fissured, ceiling panels or accepted substitution.
 - 2. Size: 24 inches by 48 inches.
 - 3. Thickness: 3/4 inches.
 - 4. NRC Range: 0.55 to 0.95, determined in accordance with ASTM E1264.
 - 5. CAC: Not less than 25.
 - 6. Panel Edge: Tegular.

7. Form and Type per ASTM 1264:
 - a. Type: III.
 - b. Form: Form 1, 2, or 4.
8. Surface Pattern: Perforated-randomly spaced holes and fissures.
9. Surface Color: White.
10. Recycled Content: At least 69 percent.
11. Suspension System: MSS-1.

B. Acoustical Ceiling Panel (ACP-2): Sound-Absorbing Impact & Humidity Resistant Ceiling Panel.

1. Basis of Design: Armstrong Fine Fissured Second Look III, No. 1762 ceiling panels or accepted substitution.
2. Size: 24 inches by 48 inches.
3. Thickness: 3/4 inches.
4. NRC Range: 0.55 to 0.95, determined in accordance with ASTM E1264.
5. CAC: Not less than 25.
6. Panel Edge: Tegular.
7. Form and Type per ASTM 1264:
 - a. Type: III.
 - b. Form: Form 1, 2, or 4.
8. Surface Pattern: Perforated-randomly spaced holes and fissures.
9. Surface Color: White.
10. Recycled Content: At least 69 percent.
11. Suspension System: MSS-1.

2.05 METAL SUSPENSION SYSTEMS (MSS)

A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard, direct-hung, metal suspension systems of types, structural classifications, finishes and accessories according to ASTM C635/C635M.

1. High-Humidity Finish: Comply with ASTM C635 requirements for "Coating Classification for Severe Environment Performance".
2. Structural classification: Heavy-duty system.

B. MSS-1:

1. Double-webbed, aluminum-capped, G30 hot-dipped galvanized grid suspension system; Finished with polyester paint and stainless steel clips; Meets ASTM C635 testing.
 - a. Products: Provide one of the following approved products:
 - 1) USG Interiors, Donn ZXLA Suspension System.
 - 2) Armstrong World Industries, Inc, Prelude XL Exposed Tee.
 - 3) Approved substitution.
 - b. Profile: 15/16 inch.
 - c. Face and Reveal Finish: Match existing.

- d. Recycled Content: Containing greater than 50 percent total recycled content in accordance with FTC guidelines.

2.06 METAL EDGE MOLDINGS AND TRIM

- A. Basis of Design: Provide Wall Molding No. 1466.01 by Rockfon products or one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed Corp.
 3. USG Interiors, Inc.
- B. 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.
 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. Aluminum Alloy: Comply with ASTM B22.
 4. Class II, Clear Anodic Finish: Comply with AA-M12C22A3.
 5. Conversion-Coated and Factory-Primed Finish: Comply with AA-M12C42R1x.
- C. Perimeter Molding Types: Provide products with hemmed edges and prefinished exposed flanges matching color of adjacent suspension system.
 1. Hemmed Shadow Molding: Stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - a. Products: Provide one of the following or an accepted alternate:
 - 1) Armstrong World Industries, Inc, Item No. 7823.
 - 2) Certainteed, Ceiling Accessories, MS174.
 - 3) USG Interiors, Inc, MS 125, Option 1 or 2.
 - b. Flange: No less than 15/16 inch.

2.07 ACCESSORIES

- A. Attachment Devices: Size for 5 times design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.108 inch diameter wire.
- C. Hold-Down Clips: Manufacturer's standard hold-down clips spaced 24 inches on center on cross tees.
- D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

2.08 SEALANTS

- A. Perimeter Sealant: Silicone-type sealant appropriate for this use. Comply with Section 079200 - Joint Sealants.

PART 3 - EXECUTION

3.01 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 existing construction for conditions that could cause future damage to acoustical ceilings. This may include plumbing piping, roof leaks, and other similar conditions. Report suspected damage to Architect prior to proceeding with Work of this Section.
- C. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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. Comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on tile and panel.
- C. Above-Ceiling Observation: Before installing acoustical ceilings, Architect will conduct an above-ceiling observation and report deficiencies in Work observed. Do not proceed with installation of acoustical ceiling support framing until deficiencies have been corrected.
 1. Notify Architect 7 days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Architect, complete the following in areas to receive acoustical ceilings:

- a. Installation, insulation, and leak and pressure testing of water piping systems.
- b. Installation of air-duct systems.
- c. Installation of air devices.
- d. Installation of mechanical system control-air tubing.

3.03 INSTALLATION

- A. Comply with ASTM C636, ASTM E580, and seismic design requirements indicated, according to manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with minimum of 3 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. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 6. 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.
 7. Space hangers not more than 48 inches on center along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tile and panel.
 1. Apply acoustical sealant in 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 on center and not more than 3 inches from ends, leveling with ceiling suspension system to 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.
- D. Install acoustical panels and tiles with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
 1. Arrange directionally patterned acoustical panels as follows:

- a. Install panels with pattern running in one direction parallel to axis of space as indicated.
2. For square-edged panel, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

3.04 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.05 FIELD QUALITY CONTROL

- A. Acoustical ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

3.06 ADJUSTING

- A. Adjust sags or twists that develop in ceiling systems and replace materials which are damaged or faulty.

3.07 CLEANING

- A. Clean exposed surfaces of acoustical ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 099000 - PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Surface preparation and application of paint and coating systems on exterior and interior substrates as indicated.
2. Items indicated in Specifications to be field-painted.
3. Maintenance repainting.

1.02 DEFINITIONS

A. Paint glosses are defined as sheen ratings of applied paint, according to ASTM D523:

1. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
2. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
3. MPI Gloss Level 5: 35 to 70 units at 60 degrees.
4. MPI Gloss Level 6: 70 to 85 units at 60 degrees.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Conduct meeting at Project site.

1. Meeting Time: Schedule meeting a minimum of 3 weeks prior to beginning Work of this Section and related Work.
2. Require attendance by Architect, Owner, Contractor, Installers, manufacturers representatives, Paint Consultant and other parties directly affecting Work of this Section.
3. Review the following:
 - a. Substrate preparation procedures for each substrate type.
 - b. Substrate moisture testing.
 - c. Plans to reduce impact on building users.

1.04 ACTION SUBMITTALS

A. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches by 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.05 INFORMATIONAL SUBMITTALS

- A. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use designations indicated on Drawings and in schedules.
 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with proposed product highlighted.
 3. Color designations.
 4. VOC content.

1.06 QUALITY ASSURANCE

- A. Mockups for New Work: 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 specified in Part 3.
 - a. Exterior Metal guardrails.
 - b. Interior gypsum wallboard surfaces.
 - 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.
- B. Mockups for Repainting of Existing Interior Work: Prepare mockups of maintenance repainting processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
1. Locate mockups in locations selected by Architect that enable viewing under same conditions as the completed Work.
 2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide Mock-up sample of at least 8 feet by 8 feet.
 3. Coating Mockups: Two surfaces of at least 8 feet by 8 feet to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.

1.07 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 50 degrees F.
1. Maintain containers in clean condition, free of foreign materials and residue.

2. Remove rags and waste from storage areas daily.

1.08 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 degrees and 95 degrees F. unless data page indicates otherwise.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F. above dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Provide products by the following:
 1. Benjamin Moore & Co.
 2. Rust-Oleum Corporation.
 3. Sherwin Williams Company (The).
- B. Products: Provide products listed in High-Performance Coatings Schedule for coating category indicated.

2.02 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 3. If a manufacturer provides more than one product within an MPI category, provide highest quality product within that category.
- C. Material Quality: Paint material containers not displaying paint manufacturer's product identification will not be accepted.
- D. VOC Content: Interior latex paints, interior primers, block fillers, wood paste and dry fall products shall comply with California Air Resource Board (CARB) 2007 or the South Coast Air Quality Management District (SCAQMD) Rule 1113, 2016.

2.03 PRIMERS, SEALERS, PREP PRODUCTS

- A. Cleaning, Etching, for Galvanized Metal: MPI #25.

1. Products: Provide one of the following:
 - a. Cloverdale Paint: Cloverdale, ClovaClean, 78100.
 - b. Green Lakes Laboratories: Clean and Etch.
 - c. Rust-Oleum: Krud Kutter, Metal Clean and Etch, ME326 or ME014.
 - d. Sherwin Williams: Great Lakes Laboratories, Clean'n Etch, 899.
 - e. Approved substitution.
 2. Field-Applied Etching Cleaner: Use in lieu of SSPC-SP 1 Solvent Cleaning, specified under preparation. Not required for shop primed ferrous metal.
- B. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149
1. Products: Provide one of the following:
 - a. Benjamin Moore: Eco Spec WB, Interior Latex Primer, N372/F372.
 - b. Sherwin Williams: ProMar 200 Zero, Interior Latex Primer, B28W02600.
- C. Primer, Rust-Inhibitive, Water Based: MPI #134 (exterior).
1. Products: Provide one of the following:
 - a. Benjamin Moore: Ultra Spec HP, Acrylic Metal Primer, HP04/FP04.
 - b. Sherwin Williams: Pro Industrial, Pro-Cryl Universal Primer, B66W1310.
 2. Application:
 - a. MPI #134: Water-based, anti-corrosive primer, interior and exterior for cleaned/etched galvanized steel.
- D. Primer, Epoxy, Anti-Corrosive, for Metal: MPI #101.
1. Products: Provide one of the following:
 - a. PPG Paints: Amerlock 2 AL, AK2-01A/ AK2-01B.
 - b. Rust-Oleum: 9300 System Epoxy Primer,
 - c. Sherwin Williams: Dura-Plate 235 Multi-Purpose Epoxy, B67W235.
 2. Application: Solvent based, 2-component, epoxy, anti-corrosive primer for interior and exterior ferrous and galvanized metals.
- E. Confirm primer material compatibility and application with manufacturer.
- 2.04 EXTERIOR POLYURETHANE-BASED PAINTS
- A. Polyurethane, Two-Component, Pigmented, Semi-Gloss (Gloss Level 5): MPI #174.
1. Products: Provide one of the following:
 - a. Benjamin Moore: Corotech, Aliphatic Acrylic Urethane Semi-Gloss, V510.

- b. Sherwin Williams: Protective & Marine, Acrolon 218 HS Polyurethane Semi-Gloss, B65W651/B65V600.

2.05 INTERIOR WATER-BASED PAINTS

- A. Latex, Interior, Institutional Low Odor/VOC, Low Sheen (MPI Gloss Level 2): MPI #144.
 - 1. Products: Provide one of the following:
 - a. Benjamin Moore: Aura, Interior Low Sheen Finish, N537/K537.
 - b. Sherwin Williams: Duration Zero VOC, Interior Acrylic Low Gloss Eg-Shell, B41W01951.
 - c. Approved substitution.
 - 2. Application: Water-based paint with low VOC. Used on interior primed wood, gypsum board, concrete, and masonry.
- B. Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 3): MPI #145
 - 1. Products: Provide one of the following:
 - a. Benjamin Moore: Aura, Interior Eggshell Paint, N538/K538.
 - b. Sherwin Williams: Duration Zero VOC Interior Acrylic Eg-Shel, B20W01951.
 - c. Approved substitution.
 - 2. Application: Water-based paint with low VOC. Used on interior primed wood, gypsum board, masonry and concrete.

2.06 EPOXY COATINGS

- A. Steel Fluoronar System: 2-part system.
 - 1. Basis of Design: Provide Fluoronar Series 1072V by Tnemec or equal:
 - a. Dry Film Thickness: 3 mils.
 - b. Volume Solids: 60 percent.
 - c. Adhesion: ASTM D4541, Type V Positester, not less than 2,083 psi.
 - d. VOC: Maximum 93 g/l.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of Work.
 - 1. Do not proceed with installation until Paint Consultant acceptance of substrate condition and moisture content.

- B. Maximum Moisture Content of Substrates: Measure at least 5 opposing points on substrate. When measured with an electronic moisture meter averages should equal the following:
 - 1. 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.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates 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 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 to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any, to white metal. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 6, "Commercial Blast Cleaning."
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
 - 1. Painting Galvanized Steel: Clean using methods recommended in writing by paint manufacturer but not less than SSPC-SP 1, "Solvent Cleaning".

3.03 APPLICATION

- A. Materials to be finished:
 - 1. Prepare and finish all surfaces of materials, except as specifically excluded or otherwise specified.
- B. Apply paints and coatings per manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Apply at dry film thickness of minimum 1.5mm per coat.
 - 2. Use applicators and techniques suited for paint and substrate indicated.
 - 3. 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.
 - 4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 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.
- C. 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.
- D. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- E. Apply paints and coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 MATERIALS NOT TO RECEIVE PAINT OR COATING

- A. Metals: Brass, bronze, copper, stainless steel, pre-finished metal, plated metals other than galvanized metal.
- B. Plastic laminate, melamine, and other finished plastic surfacing.
- C. Roofing, masonry, stone, and concrete.
- D. Glass and clear plastic.
- E. Substrates with specified factory-applied colored finishes:
 - 1. Includes: Door hardware, electrical switch plates, fabrics, tackboards, porcelain enameled metal fabrications, and lighting fixtures.

2. Exception: Wire mold and other normally prefinished items mounted on surfaces receiving paints or coatings. Paint to match field surface.

- F. Inaccessible materials permanently enclosed behind building construction and structural components.

3.05 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. 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, pay for testing and apply additional coats to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.06 CLEANING AND PROTECTION

- A. 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.
- B. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.07 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board Substrates:
 1. Overhead/ Ceiling Gypsum and Plaster Latex over Latex Sealer System:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #149.
 - b. Intermediate Coat: Latex, interior, match topcoat.
 - c. Topcoat:
 - 1) Latex, interior, (MPI Gloss Level 2), 2 coats. MPI #144.
 2. Vertical/ Wall Gypsum Latex over Latex Sealer System:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #149.
 - b. Intermediate Coat: Latex, interior, match topcoat.
 - c. Topcoat: Latex, interior, (MPI Gloss Level 3), MPI #145.

3.08 EXTERIOR PAINTING SCHEDULE

- A. Int/Ext Cold-Applied Zinc Steel, Opaque: Applied to structural steel, hollow metal doors and frames, indicated to receive a colored coating.
 - 1. Zinc-rich, Epoxy, Fluorourerathane System:
 - a. Primer: Shop-applied, as specified in Section 051200 - Structural Steel.
 - b. Intermediate Coat: Shop-applied, as specified in Section 051200 - Structural Steel.
 - c. Topcoat: Fluoronar System, as specified in Part 2.
- B. Galvanized Steel Substrates, Opaque:
 - 1. Water-Based Light Industrial Coating System: Exterior pipe and tube railings, miscellaneous galvanized metals, prepared to receive coatings.
 - a. Pretreatment: Cleaner, etching for galvanized metal, MPI #25.
 - b. Pre-primer Coat: Primer, Rust-inhibitive, water-based MPI #134.
 - c. Primer: Epoxy, Anti-Corrosive, for Metal: MPI #101.
 - d. Intermediate Coat: Match topcoat.
 - e. Topcoat: Polyurethane, Two-Component, Pigmented, Semi-Gloss (Gloss Level 5): MPI #174.

3.09 GLOSS AND COLOR SCHEDULES

- A. Gloss Levels: As scheduled in this Section.
 - 1. Gypsum Board:
 - a. Overhead/Ceilings: MPI Level 3 (Eggshell).
 - b. Vertical/Walls: MPI Level 3 (Eggshell).
- B. Architect will provide Color Schedule after award of Contract, and paint manufacturer has been established.

END OF SECTION

SECTION 118129 - FACILITY FALL PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Fall protection tie-back anchors.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct meeting at Project site.
1. Attendees: Contractor, Installer, manufacturer's representative, and representatives of other affected trades
 2. Agenda: Review safety restraint system procedure, acceptance of substrate surfaces, and coordination with other entities affecting this Work.
 3. Tour Project Site Areas. Inspect and discuss conditions of substrate, structural supports, access and proposed use of system, penetrations required at anchor locations, and preparatory Work performed by others.
 4. Schedule meeting at least 1 week before start of installation.

1.03 ACTION SUBMITTALS

- A. Product Data: Manufacturer's specifications and technical data including performance, construction and fabrication.
1. Provide data showing compliance with minimum 5,000 pounds against fracture or detachment.
- B. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, for the complete system.
1. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State of Oregon. Include seal and signature of professional engineer on Shop Drawings.
 - a. Do not submit design calculations.
 2. Submit inspection logbook certifying system, noting deviations, changes or corrections.
- C. Delegated-Design Submittal: For fall protection system, including attachment and anchorage to building construction comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

- A. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- B. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- C. Manufacturer's installation instructions.
- D. Manufacturer's field test reports.

1.05 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Data: For installed products. Include the following:
 - 1. Manufacturer's instructions covering maintenance requirements and parts catalog giving complete list of repair and replacement parts with cuts and identifying numbers.
 - 2. System Equipment Manual and Inspection Log Book, with "Initial Inspection - Certification for Use" and "Inspection Sign-Off" forms completed.
 - 3. Record Drawings indicating equipment locations and details. Ensure drawings are posted adjacent exits to roof.

1.06 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Not less than 5 years of experience in actual production of specified products and capable of providing field service representation during construction and approving application method.
- B. Installer's Qualifications: Firm with not less than 5 years of experiences in installation of equipment similar in complexity to those required for this Project, including specific requirements indicated.
 - 1. Acceptable to or licensed by manufacturer.
 - 2. Successfully completed not less than 5 comparable scale projects using this equipment.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.
- B. Storage and Protection:
 - 1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.08 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fall restraint systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Structural failures including excessive deflection.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - c. Failure of operating components.
 - 2. Warranty Period: Minimum of 10 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Provide products by Pro-Bel Group or comparable products from one of the following:
 - 1. Atlas Anchor Systems USA, Co.
 - 2. Guardian Fall Protection Inc.
 - 3. HighRise Systems, Inc.
 - 4. Spider, division of SafeWorks, LLC.
 - 5. Summit Anchor Company, Inc.
 - 6. Thaler Metal Industries, Ltd.
 - 7. Trittech Fall Protection Systems.

2.02 PERFORMANCE CRITERIA

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 013573 - Delegated Design Procedures, to design fall protection system, including attachment and anchorage to building construction. Locations of fall arrest on Drawings are estimate locations for bidding purposes only
- B. Fall Arrest Safety Anchors and Supports: Comply with ANSI/IWCA I-14.1 and as follows:
 - 1. Fall Arrest Safety Anchors:
 - a. Fall arresting force safety factor of 2 to 1 without permanent deformation: 1,800 pounds minimum.
 - b. Fall arresting force against fracture or detachment: 5,000 pounds minimum.
 - c. Design anchor components to provide adequate attachment to building and suited to current fall restraint practices. Ensure compatibility with industry standard equipment.

- d. Ensure anchor components conform to proper engineering principles and have been designed by a professional engineer qualified in design of window cleaning/suspended maintenance equipment, its applications, and safety requirements.
- C. Fall Arrest Systems and Layout: Comply with OSHA walking-working surfaces standard 29 CFR Part 1910 Subpart D and I to provide adequate protection of general industry employees and employers from hazards associated with walking-working surfaces.

2.03 TIE-BACK SYSTEM

- A. Safety U-Bars: Mild steel, Type 300W with 444000 psi minimum yield strength, hot-dip galvanized according to ASTM A123, or stainless steel, ASTM A276, Type 304, with 35000 psi minimum yield strength.
 - 1. U-Bar Size: 0.75 inches minimum diameter material with 1.5 inches eye opening.
- B. Securement Bolts: Mild steel, Type 300W with 44000 psi minimum yield strength, hot-dip galvanized to ASTM A123.
- C. Hollow Steel Section (HSS) Piers: Mild steel, Type 300W with 50 Ksi minimum yield strength, hot dipped galvanized to ASTM A123 or with manufacturer's 2-component TPU polyurethane/polyurea coating system.
 - 1. Plug vent holes after galvanizing process.
 - 2. Wall Thickness: Design to meet Project design requirements indicated.
- D. Base Plate and Other Sections: Mild steel, Type 300W with 44000 psi minimum yield strength, hot-dip galvanized per ASTM A123.
 - 1. Wall Thickness: Design to meet Project design requirements indicated.
- E. Seamless Spun Aluminum Flashing (for Steel Pier Anchors): ASTM B221, Type 6061-T6 alloy with deck flange flashed in per NRCA or CRCA recommendations. Seal top of aluminum flashing with conformable mastic tape and torch applied heat-shrink rubber collar flashing.
- F. Miscellaneous Bolts, Nuts, and Washers: Mild steel, Type 300W with 44000 psi minimum yield strength, hot-dip galvanized per ASTM A123 or stainless steel, ASTM A276, Type 304, with 35000 psi minimum yield strength.

2.04 FABRICATION

- A. Fabricate Work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.
- B. Grind off surplus welding material and ensure exposed internal corners have smooth lines.
- C. Fabricate joints in manner to prevent ponded or trapped water, provide weep holes to drain water where determined by fabricator.

- D. Coordinate anchorage system with supporting building structure. Fabricate and locate anchoring devices as determined by manufacturer's engineer to provide adequate support for system's intended use.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Report conditions that deviate from approved Shop Drawings, or defects in workmanship that would cause an unsafe installation.
 - 2. Correct conditions detrimental to timely and proper execution of Work.
 - 3. Do not proceed until unsatisfactory conditions have been corrected.
 - 4. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance by installer.
 - 5. Faults occurring in Work of this Section due to acceptance of unsatisfactory conditions shall be corrected at no additional cost to Owner.
- B. Verify structural steel designed to receive safety anchors has adequate bearing surface as indicated on approved Shop Drawings to ensure 100 percent weld.

3.02 INSTALLATION

- A. Install equipment per manufacturer's instructions and per approved Shop Drawings. Install equipment level, tightly fitted, and flush to adjacent surfaces as needed for proper installation.
- B. Coordinate anchor installation with roofing installation to ensure a watertight and warrantable condition of roofing system. Directly flash anchors into roofing in manner compatible with roofing system and anchors.
- C. When components come into contact with dissimilar metals, keep surfaces from direct contact to prevent corrosion.
- D. Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal and vandalism.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage qualified independent testing and inspecting agency to inspect installation of equipment in progress.
- B. Onsite inspection of equipment welded to structure shall be performed by an AWS Certified Welding Inspector verifying, in writing, size and quality of welds. Inspection shall be performed on each piece of equipment before roofing material is installed.

- C. Test equipment under supervision of professional engineer with experience with suspended maintenance equipment and manufacturers guidelines.
- D. Manufacturer shall assist and/or supervise installation of roof fall restraint equipment installed by others when such is included in contracted.
- E. Manufacturer's Field Services: Schedule manufacturer's technical representative for site visits to review Work as follows:
 - 1. After delivery and storage of products.
 - 2. When preparatory work for which Work of this Section depends is complete, but before installation begins.
 - 3. Regular intervals during progress of Work and at 25 percent and 60 percent of completion.
 - 4. Upon completion of Work, after cleaning is carried out.
- F. Testing: Test on site 100 percent of anchors relying upon chemical adhesive fasteners using load cell test apparatus per manufacturer's written recommendations.

3.04 ADJUSTING

- A. Verify that completed Work has been installed correctly and products function properly. Make adjustments where needed to ensure satisfactory operation.
- B. Complete inspection logbook to certify system for use noting deviations, changes, or corrections from approved Shop Drawings. Provide as-built anchor layout plan on 11 inch by 17 inch paper or larger together with annual inspection with log book.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation and maintenance procedures to Owner and maintenance staff per OSHA walking-working surfaces standard 29 CFR Part 1910 Subpart D and I final rule training requirements.

3.06 CLEANING

- A. After roofing operations are completed, clear anchor areas of aggregate or other debris which may interfere with fall restraint operation.

END OF SECTION