



HWY 291 & NE Langsford Rd

OVP No: 38200P368999
890 E Langsford Rd
Lee's Summit, MO 64063

CORE STATES GROUP

6500 Chippewa St., Ste. 200
St. Louis, MO 63109

CHASE DESIGN STANDARDS BASIS: v20.2

Relevant sections of Part 1 and Division 1 may be superseded by
"Master Bid Clarification Document" posted to TotalBid by
CBRE/CM

Issue	Date	Description
1	12-21-2020	V20.2 Design Standards

PROJECT MANUAL

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NOT USED

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SECTION 001116 – SAMPLE INVITATION TO BID TEXT

To: Invited Bidders

From: CBRE: Pamela Holmes

Re: HWY 291 & SE Langsford Rd.
890 E. Langsford Rd.
Lee's Summit, MO 64063

CC:

The following is an Invitation to Bid.

1. Request for Bids

Your firm is invited to submit a bid for the construction of a new [freestanding branch bank for JPMorgan Chase Bank, N.A. located at 890 E. Langsford Rd., Lee's Summit, MO 64063.

2. Bid Documents Availability

Bid Documents will be posted on TotalBid on for viewing and download at the following website address. No hardcopy documents will be provided by the Owner or Architect.

<https://www.cpbid.com/contract/userLogin.php?return=%2Fcontract%2Fowner%2Fwelcome-architect-home.php>

There is no cost for document viewing or download.

General Contractor may not place bid documents in nor advertise project through any on-line plan rooms or construction publications. General Contractor may place bid documents on General Contractor's own secure, password-protected FTP or similar website.

3. Bid Submittal Information

Below is a summary of bid submittal information. Complete bidding instructions will be issued in the Project Manual – Instructions to Bidders section at time of document posting.

Bid Number: TBD

Bid Due Date: TBD

Bid Due Time: TBD

Mailing Information: N/A

The Owner's Representative will receive Bids uploaded to TotalBid

To: CBRE

Attn: Pamela Holmes

314.210.7690

Pamela.holmes@jpmchase.com

CHASE
SECTION 001116 – SAMPLE INVITATION TO BID TEXT

4. Project Team

Construction Project Manager and Chase Consultant:
Pamela Holmes
314.210.7690
Pamela.holmes@jpmchase.com

Architect of Record:
Core States Group
R. Bruce LaSurs
314.210.7690

Chase Architectural Designer:

Additional consultants:
Refer to Construction Documents

5. Project Manager/Designated Contact

All inquiries, requests for clarification, and requests for additional information shall be addressed to the Architect of Record thru TotalBid website, shall be submitted in writing on the standard RFI form provided in the Project Manual.

6. Pre-Bid Site Visit

A Pre-bid Site Meeting will take place at the site on **TotalBid**. All general and sub-contractors are invited to attend.

7. Bid Opening

Owner will hold a private bid opening. Refer to TotalBid for date and time.

8. Select List of Bidders

N/A: Information not published

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SECTION 002113 - INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.01 DEFINITIONS

- A. Definitions set forth in the General Conditions, AIA Document A201-2007, are applicable to these Instructions to Bidders.
- B. Bidding Documents include the Instructions to Bidders, Bid Form and the proposed Contract Documents including Addenda issued prior to receipt of bids.
- C. Addenda are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents, including Drawings, Conditions of the Contract and Specifications, by additions, deletions, clarifications or corrections. Addenda will become part of the Contract Documents when the Construction Contract is executed.

1.02 BIDDING DOCUMENTS

- A. Bid Documents will be posted on TotalBid for viewing and download at the following website address. No hardcopy documents will be provided by the Owner or Architect.

<https://www.cpbid.com/contract/userLogin.php?return=%2Fcontract%2Fowner%2Fwelcome-architect-home.php>

- B. Complete sets of Documents shall be used in preparing bids; neither the Owner nor the Architect assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Documents.

1.03 BIDDERS REPRESENTATION

- A. Each Bidder by making a bid represents that the Bidding Documents have been carefully examined and understood, that the Bidder has visited the site and has become familiar with the local conditions and limitations under which the work is to be performed and that the Bidder has included a sum in the bid to cover the cost of every item included in the Bidding Documents.
- B. No extra compensation will be allowed for any matter or thing, concerning which the Bidder might have fully informed himself prior to submitting a bid.

1.04 EXAMINATION OF BIDDING DOCUMENTS

- A. Should a Bidder find discrepancies, inconsistencies or obscurities, in, or omissions from the Bidding Documents, or should there be a doubt as to their meaning, the Bidder shall at once notify the Architect, who will issue a written Addendum, clarifying the intent of the Documents. Items not brought to the Architect's attention during the bidding period shall be done in accordance with the Architect's interpretation for the good of the work in accordance with the intent and meaning of the Contract Documents. Neither Owner nor Architect will be responsible for oral instruction or information. Questions received less than 8 days before the Bid Opening cannot be answered in writing.
- B. Prior to the receipt of bids, Addenda will be mailed, faxed or delivered to each person or firm recorded by the Architect as having received the Bidding Documents thru TotalBid website. Answers will be posted not less than 7 days before Bid Opening.
- C. Addenda issued during the time of bidding are to be included in the bid and shall become a part of the Bidding Documents. Acknowledge receipt of Addenda on the Bid Form in the space provided.

1.05 SUBSTITUTIONS

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SECTION 002113 - INSTRUCTIONS TO BIDDERS

- A. Products are generally specified by Reference Standard and/or manufacturer's name and model number or trade name. When specified only by Reference Standard, the Contractor may select any product meeting this standard by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed.
- B. GCs are to provide project proposals based on specified materials during bidding process. Once the project is awarded, the GC will have the opportunity to submit substitution requests via a submittal with all required backup to support the request to the architect for approval.

1.06 BIDDING PROCEDURES

- A. Bids are due via TotalBid Process. Follow instructions to Bidders for bidding process.
- B. No Bids may be modified or withdrawn after the bid submittal and must be valid for 60 days from submittal date to TotalBid.

1.07 SUBCONTRACTOR LIST FORM

- A. The completed form, including address, phone number and contact, shall be submitted by the apparent low bidder(s) within 48 hours after submission of bid.

1.08 REJECTION OF BIDS

- A. The Bidder acknowledges the right of the Owner to reject any or all bids, to waive any informality or irregularity in any bid received, or to withhold the award for any reason he determines. In addition, the Bidder recognizes the right of the Owner to reject a bid if the Bidder failed to furnish required bid security, or to submit the data required by the bidding Documents, or if the bid is incomplete or irregular.

1.09 QUALIFICATIONS OF CONTRACTORS

- A. See Instructions to Bidders for qualifications.

1.10 AGREEMENT

- A. See Instructions to Bidders under supporting documents section.

1.11 AWARD OF CONTRACT

- A. Bidders are hereby notified that a single lump contract will be awarded for this work.

1.12 CONTRACTORS LICENSE LAW

- A. Contractor shall comply with, and require Subcontractors to comply with, State, City, or Local Jurisdiction's Contractors License Laws, and be duly registered and licensed thereunder. Provide photocopy of License attached to Bid Form.

END OF SECTION

1.1 GENERAL REQUIREMENTS

- A. Furnish Testing and Inspection Services for the above Project.
- B. Reference to "testing laboratory" in singular shall not be construed to limit work under this document to a single testing agency.
- C. Comply with requirements of all applicable building codes as well as any other local rules and regulations as may be applicable and required by any other jurisdiction having authority.
- D. Personnel employed in the inspection of soil, rock, concrete, and steel, specified under Divisions 3, and 5, and 31 of these specifications shall be qualified under the requirements of ASTM E329 - Standard Specification for Agencies engaged in the Testing and/or Inspection of Materials Used in Construction.
- E. Inspection and Test Reports: Prepare reports giving results and observations of tests, and stating compliance or noncompliance with Contract Documents. Include records of observations and tests performed, and other items as specified, herein.
- F. Duties and Responsibilities of the Testing Laboratory.
 - 1. Submit written reports of inspections and tests to the Owner, Architect, and other parties designated by the Owner.
 - 2. Submit copies of inspection reports to the jurisdictional building department, as required.
 - 3. Submit copies of inspection reports to the Architect's Structural Engineer of items specified in Divisions 3, 4, and 5.
 - 4. Upon request, provide interpretation of test results.
- G. Testing Laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the work.
 - 3. Perform any duties of the Contractor.

1.2 EQUIPMENT

- A. Furnish all equipment to perform the required tests and inspections, except as required to be furnished by the General Contractor as described in the Contract Documents.

1.3 REQUIRED TESTS AND INSPECTIONS

- A. Earthwork:
 - 1. Inspect spread footing excavations for conformance to the Contract Documents.
 - 2. Fill Materials: Perform tests to determine acceptability for use.
 - 3. Compaction: Perform density tests to determine compliance with specified compaction requirements.
- B. Trenching and Piping:
 - 1. Perform compaction tests for bedding at one test per 100 linear feet of pipe bedding.
 - 2. Perform compaction tests at one compaction test per lift per 100 linear feet of fill over pipe.
- C. Asphalt Paving:
 - 1. Perform in place density tests with a nuclear gage.
 - 2. Record ambient and asphalt temperatures.
 - 3. Perform Marshal Analysis tests to determine asphalt composition. Perform one test per day.
- D. Concrete Formwork:
 - 1. Inspect forms for location, design, configuration, and seal of form joints and ties.
 - 2. Check condition of bond surfaces, locations and sizes of all embedment items, and anchorage for prevention of displacement.
- E. Steel Concrete Reinforcement:
 - 1. Obtain a copy of approved reinforcing steel placement drawings from the General Contractor.
 - 2. Check reinforcement in place prior to the placement of concrete.
 - 3. Testing procedure shall conform to ASTM A615.

SECTION 003153 - OWNER-PAID TESTING AND INSPECTION SERVICES

F. Concrete:

1. Analyze concrete mix design.
2. Aggregate: Review source of aggregate to verify that supplier can furnish concrete of consistent quality.
3. Require mill reports for cement used. Perform tests on cement, at Contractor's expense, if reports cannot be furnished.
4. Inspect consolidation methods and finishing for conformance with contract requirements.
5. Slump and Air Content:
 - a. ASTM C 172, except modified for slump to comply with ASTM C94.
 - b. Test when strength specimens are made, and as often, in the professional opinion of the testing agency, as is necessary for control checks and acceptance proposed.
6. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degrees F. and above; and each time a set of compression test specimens is made.
7. Compressive Strength Tests: Test in accordance with ASTM C 39. Compression Test Specimens:
 - 1) Collect in accordance with ASTM C31; mold and store cylinders for laboratories cured test specimens, except when field-cured test specimens are required.
 - 2) Provide one set of 5 cylinders of each concrete class placed in any one day, or for each 5,000 sq. ft. of surface area placed, unless otherwise indicated. Utilize cylinders in testing procedures as follows: 1 cylinder tested at 7 days, 1 cylinder tested at 14 days, 2 cylinders tested at 28 days, and 1 cylinder retained in reserve for later testing if required. Special Requirements for Early Strength Concrete: Provide 2 additional cylinders (for a total of 7 per set) while placing concrete that will be post-tensioned. Test the 2 additional cylinders at 14 day.
 - 4) Special Requirements for Drilled Piers: Provide one set of 5 cylinders per 50 cubic yards or fraction of drilled pier concrete
- c. When the frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
- d. When the strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, notify all parties immediately by use of faxed test reports.
8. Concrete Reports shall include:
 - a. Weather and date of pour.
 - b. Name of concrete supplier and truck number.
 - c. Exact mix used and maximum size of aggregate.
 - d. Location in building where placed.
 - e. Cylinder identification.
 - f. Date cylinder received in laboratory.
 - g. Slump data.
 - h. Brand and type of cement used.
 - i. Entrained air content (if required).
 - j. Amount of water added after batching, if any.
 - k. Sequential numbering of reports.
 - l. Compressive strengths.
9. Report test results in writing to the Architect and the Contractor on the same day that tests are made.

G. Concrete Unit Masonry:

1. Take samples of mortar during masonry construction, in accordance with ASTM C109, and grout in accordance with ASTM C1019. Take one test (3"x3"x6" prism) and cast two specimens for each 30 cu. yd. of grout placed each day.
2. Mill reports for masonry units are required. Perform tests if reports are unavailable. Notify the Owner of the extra service performed.
3. Testing of reinforcing shall be as specified for steel concrete reinforcing.

H. Drilled in Anchors, Anchor Bolts, Headed Studs, and Epoxy or Cement Grouted Dowels or Anchors:

1. Provide periodic inspection of installation, including drilled holes after cleaning.
2. Confirm proper edge distances, depths, and spacings.

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SECTION 003153 - OWNER-PAID TESTING AND INSPECTION SERVICES

3. Provide tension testing. Test anchors indicated on Structural Drawings in accordance with the Structural Notes.
- I. Structural Welding:
 1. Perform periodic visual inspection of all field fillet welding, including stud anchor welds. Inspection of fillet welds shall be in accordance with AWS D1.1. 15 percent of all fillet welds shall be inspected by magnetic particle or dry penetrant methods. All full penetration welds shall be tested by ultrasonic methods in accordance with the requirements of AWS D1.1, Section 6, part III, by ASNT Level II technicians. Any frequency (1.0, 2.35, 5.0 MHz) and angle (45, 60, 70, and 90) may be used to indicate the size, orientation, and type of discontinuity more accurately.
 2. Verify welding materials, equipment, and welder qualifications.
 3. Inspection reports shall include the following:
 - a. Item inspected.
 - b. Welder's name, certificate expiration date, certified positions.
 - c. Electrode used.
 4. Exceptions to Welding Inspection: Shop welding need not be inspected when shop has been registered and approved by jurisdictional code authorities.
- J. Structural Steel
 1. Mill reports are required for all structural steel materials. Perform tests to verify strength of steel if mill reports cannot be furnished by the supplier to the laboratory for certification. Notify the Owner of extra services performed.
 2. Shop Fabrication: Furnish visual inspection during fabrication of structural steel and components (AISC certified fabricators exempt from inspection requirement). Shapes, sizes, classes, and types of steel and threaded fasteners shall be verified for conformance with Contract Documents.
 3. Field Assembly: Perform visual inspection of the installation of structural steel. Verify locations of all anchorages and inserts. Where adjustments are required, reinspect to confirm compliance with Contract Document requirements.
- K. EIFS: Perform periodic inspection as necessary to verify condition of substrate, compliance with Contract Documents, materials handling, application procedures, treatment of joints and penetrations, temporary protection, provisions for weeping and drainage, and sealant installation.
- L. Roofing: Inspect roof deck before roofing is started; perform inspection while roofing is being installed to verify compliance with Contract Documents and roofing materials manufacturer's specifications. Inspect all roof related flashing.
- M. Waterproofing:
 1. Verify substrate condition prior to application of waterproofing materials.
 2. Observe installation procedures as necessary to verify proper installation thicknesses and techniques.
- N. Curtain Wall Field Test:
 1. Water Penetration: Test curtain wall mock-up in accordance with ASTM E1105 at selected location as approved by the Architect. Include test of window and sloped glazing as a single unit. Should testing show leakage, allow for remedy and retest.
 2. Sealant Adhesion: After sealant is fully cured (minimum 14 days) perform sealant adhesion test in strict accordance with sealant manufacturer's prescribed procedure.

END OF SECTION

CHASE
SECTION 003160 – SOILS REPORT

See attached Soils Report for this project

CHASE
REQUEST FOR INFORMATION FORM

RFI NO. _____

Date: _____

To: _____ From: _____

Spec Sec. Ref: _____ Para: _____ Drawing Ref: _____ Detail: _____

Signed: _____

Response: _____

☐ Attachments

Response From: _____ To: _____ Sent: _____ Rec'd: _____

Signed: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ File

**Please reach out to
CSG for CAD Release Document**

SECTION 006325 - SUBSTITUTION REQUEST FORM

TO: _____

DATE: _____

ATTN: _____

We hereby submit the following for your consideration in lieu of the specified item(s) for the above project:

Specification Section _____ Paragraph _____ Referenced Drawing(s) _____

Specified Item: _____

Proposed Substitution: _____

Reason for Substitution: _____

COMPLETE THE FOLLOWING (Use back or additional sheets if necessary).

1. Does the substitution affect dimensions shown on Drawings? Yes _____. No _____.
If yes, indicate changes: _____

2. What effect does the substitution have on other trades? _____

3. What effect do applicable code requirements have on substitution? _____

4. Describe the differences between the proposed substitution and the specified item(s):

5. How do manufacturer guarantees compare between proposed and specified items?

☐

Same

☐

Different (Explain on back.)

Attachments: _____

What is projected lump sum installed cost difference between proposed substitution and least expensive specified item? \$ _____. [Ø; (decrease); increase]

The undersigned hereby

- Certifies that the proposed substitute item has been fully investigated and has been determined to be equal or superior to that specified in all respects; that the same or greater warranty will be furnished, that required maintenance service and source for replacement parts are available, and that incorporation of the proposed substitute item will not affect functional clearances.
- Warrants that coordination, installation, and changes to the project as necessary to accommodate the proposed substitution shall be the Contractor's responsibility, that use of the substitute item(s) will not delay project completion, and that claims for additional costs related to its incorporation which may become subsequently apparent will be borne by the Contractor.

Approved For Architect Review: _____

Signature

Title

Signature shall be by a person having authority to legally bind the Contractor to the above terms.

☐ Substitution Recommended
Subject to Owner's Consent☐ Substitution Recommended
As Noted
Subject to Owner's Consent☐ Substitution Not
Recommended☐ Substitution Returned –
Insufficient Information

Date: _____

By: _____ (Architect of Record)

Signature

Title

Owner's Consent

☐

Yes

☐

No

Date: _____

By: _____ OWNER

Signature

Title

END OF SUBSTITUTION REQUEST FORM

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SECTION 007200 – GENERAL CONDITIONS

The "General Conditions of the Contract for Construction," AIA Document A201, 2007 Edition, hereby included by reference, shall govern the Work.

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SECTION 007200A – APPENDIX A TO GENERAL CONDITIONS

JP MORGAN CHASE BANK, NA
STATEMENT OF CLAIM FORM
Claim No. ____ for Contractor

1. Name of Contractor: _____

2. Date of this Notice of Claim: _____.

3. Contractor's representative to contact regarding the claim:

Name: _____ Title: _____

Telephone No. _____ (office) FAX No. _____

E-mail: _____

4. General description of claim:

5. Contract Documents. If the claim is based upon any part or provision in the Contract Documents, including but not limited to pages in the Drawings and/or paragraphs in the Specifications, Owner-Contractor Agreement, General Conditions or Supplementary General Conditions, state upon which parts or provisions the claim is based:

6. Delay claims:

6.1 Date delay commenced: _____

6.2 Duration or expected duration of the delay, if known: _____

6.3 Apparent cause of the delay and part of critical path affected:

6.4 Expected impact of the delay and recommendations for minimizing such impact:

7. Additional compensation. Set forth in detail all additional compensation to which the Contractor believes it is entitled with respect to this claim:

8. Instructions for Completing the Statement of Claim Form ("Instructions"). The Instructions are incorporated in this Form.

9. Truth of Claim. By submitting this claim, the Contractor and its representative certify that to the best of his or her knowledge and belief a) the Contractor has complied fully with the Instructions, and b) the information in this State of Claim is accurate. The Contractor by its authorized representative must acknowledge this Statement of Claim before a notary public.

CONTRACTOR: _____

By: _____

Name and Title: _____

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SECTION 007200A – APPENDIX A TO GENERAL CONDITIONS

CONTRACTOR'S ACKNOWLEDGMENT

State of _____,

County of _____, ss:

_____ first being sworn, states that the statements made in attached Statement of Claim Form are complete and true to the best of his or her knowledge and belief.

Sworn to before me a notary public by _____ on _____, 20__.

Notary Public

WHEN COMPLETED, FORWARD A COPY OF THIS NOTICE AND STATEMENT OF CLAIM FORM TO THE OWNER AND ARCHITECT

INSTRUCTIONS FOR COMPLETING THE STATEMENT OF CLAIM FORM

1. Completing the Statement of Claim Form ("Claim Form") is a material term of the Contract. The Claim Form tells the Owner and Architect that the Contractor is making a Claim and that they need to act promptly to mitigate the effects of the occurrence giving rise to the Claim. The Claim Form also provides them with information so that they can mitigate such effects. The Contractor acknowledges that constructive knowledge of the conditions giving rise to the Claim through job meetings, correspondence, site observations, etc. is inadequate notice, because knowledge of these conditions does not tell the Owner and Architect that the Contractor will be making a Claim and most often is incomplete.
2. If the space provided in the Claim Form is insufficient, the Contractor, as necessary to provide complete and detailed information, must attach pages to the Claim Form with the required information.
3. Paragraph 4. The Contractor must state what it wants, *i.e.*, time and/or compensation, and the reason why it is entitled to time and/or compensation.
4. Paragraph 5. The Contractor must identify the provisions of the Contract Documents it is relying on in making its Claim. For example, if the Claim is for a change in the scope of the Contractor's Work, the Contractor must identify the specific provisions of the Specifications, and the Plan sheets and details that provide the basis for the scope change.
5. Paragraph 6. This paragraph applies to delay claims, including delays that the Contractor believes result in constructive acceleration. The Contractor must identify the cause of the delay, party or parties responsible, and what the party did or did not do that caused the delay, *i.e.*, specific work activities. The Contractor acknowledges that general statements are not sufficient, and do not provide the Owner with sufficient information to exercise the remedies available to the Owner or to mitigate the effects of the delay.

For example, if the Contractor claims a slow response time on submittals caused a delay, the Contractor must identify the specific submittals, all relevant dates, and then show on the applicable schedule, by circling or highlighting, the activities immediately affected by the delays. Also for example, if the Contractor claims it was delayed by another person, the Contractor must identify the other person, specifically what the other person did or did not do that caused the delay, and then show the applicable schedule, by circling or highlighting, the activities immediately affected by the delays. Further by example, if the Contractor seeks an extension of time for unusually severe weather, the Contractor must submit comparative weather data along with a record of the actual weather at the job site and job site conditions.

6. Paragraph 6.4. Time is of the essence under the Contract Documents. If there is a delay, it is important to know what can be done to minimize the impact of the delay. It therefore is important that the Contractor provide specific recommendations on how to do so.
7. Paragraph 7. The Contractor must provide a specific and detailed breakdown of the additional compensation it seeks to recover. For future compensation, the Contractor shall provide its best estimate of such compensation.
8. Paragraph 8 and Acknowledgment. By submitting this Claim, the Contractor and its representative certify that to the best of his or her knowledge and belief a) the Contractor has complied fully with the Instructions, and b) the information in this Claim Form is accurate. The Contractor by its authorized representative must acknowledge this Statement of Claim before a notary public.

END OF INSTRUCTIONS

CHASE
SECTION 007300 – SUPPLEMENTARY CONDITIONS

JP MORGAN CHASE CORPORATION
STATE RETAIL BANKING CENTER CONTRACT

SUPPLEMENTARY CONDITIONS

The following supplementary conditions modify, change, delete from, or add to the “General Conditions of the Contract for Construction,” AIA Document A201-2007. Where an Article of the General Conditions is modified or a Section, Subsection, or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Section, Subsection, or Clause shall remain in effect. In all respects, these Supplementary Conditions shall be construed in a manner consistent with the A201 General Conditions, the Contract Documents, and the goals of the Project. Together with AIA Document A201, these Supplementary Conditions are sometimes referred to as the “Modified General Conditions.”

ARTICLE 1: GENERAL PROVISIONS

1.1 (Add.) The definitions in this Section 1.1 shall apply throughout the Contract Documents.

1.1.1 (Delete this section in its entirety and replace with the following.)

The Contract Documents are the Contract Documents identified in the Owner-Contractor Agreement (“Agreement”). A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect.

(Add the following Sections.)

1.1.9 SUBSTANTIAL COMPLETION

Substantial Completion shall have the same meaning as the “Work is Complete”.

1.1.10 DATE FOR SUBSTANTIAL COMPLETION

The Date for Substantial Completion is the Date for Substantial Completion as set forth in the Owner-Contractor Agreement. The Date for Substantial Completion shall only be changed or modified by Change Order, other Modification or a Claim that is Finally Resolved, regardless of any dates in the Construction Schedule.

1.1.11 FINALLY RESOLVED

Finally Resolved means that the Initial Decision Maker has made a decision on a Claim under Section 15.2.6.1 of the General Conditions and that any litigation or arbitration regarding the Claim has been finally concluded, including any appeals.

1.1.12 CLAIM

Claim is defined in Section 15.1.1 of the General Conditions.

1.1.13 STATEMENT OF CLAIM FORM

Statement of Claim Form means the Statement of Claim Form included as Appendix A to these Supplementary Conditions.

1.1.14 WORK IS COMPLETE

Work is Complete shall mean that the Project is complete and ready for full occupancy with only a very limited number of minor defects and/or items of incomplete or non-conforming Work that have no adverse impact on the use or occupancy of the Project. This includes the interior and exterior, landscape and irrigation, but does not include work to be performed by the Owner’s subcontractors, including but not limited to bank equipment, telephones and data security and signage. All finishes must be complete, all systems fully functional, including permanent power, and a Certificate of Occupancy (if applicable) issued by the authority having jurisdiction. If a Certificate of Occupancy is not required, the Architect will determine if the building is complete and will issue a Completion Letter.

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1.1.15 FINAL COMPLETION

Final Completion shall mean that the Work is complete in all respects in accordance with the Contract Documents and the Contractor has submitted to the Architect all documents required to be submitted to the Architect for final payment.

1.5.1 (Delete this section in its entirety and replace with the following.)

The Owner shall be deemed the owner of the Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Owner's rights.

ARTICLE 2: OWNER

2.1.1 (Delete this section in its entirety and replace with the following.)

The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative. The Owner's representative shall only have such authority as is expressly authorized in writing.

2.2.1 (Delete this section in its entirety and replace with the following.)

The Contractor agrees that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract.

2.2.3 (Delete this section in its entirety and replace with the following.)

To the extent necessary for the Work and as requested in writing by the Contractor, the Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

2.2.5 (Delete this section in its entirety and replace with the following.)

Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor ten (10) copies of the Drawings and Specifications for the execution of the Work. The Owner will provide additional copies at the actual cost of reproduction, postage and handling.

2.2 (Delete the word "persistently" in this Section.)

2.3 (Replace "a ten day period" with "five (5) business days".)

ARTICLE 3: CONTRACTOR

3.2.1 (Delete this paragraph in its entirety and replace with the following.)

The Contractor represents that it has review, inspected, and compared the site with the Contract Documents as provided in the Contract Agreement.

3.3.1 (Add the following at the end of the first sentence "and consistent with the skill of a competent contractor".)

(Add the following sections.)

3.5.1 The warranty under Section 3.5.1 shall be in addition to the specific warranties required under individual sections of the Specifications.

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3.5.2 If the Contractor breaches any of its warranties under Section 3.5.1, the Contractor will pay the Owner for its damages and expenses, including but not limited to attorneys' and consultants' fees and expenses, arising out of or related to such breach.

3.6 (Add the following language at the end of the section.)

The Contractor shall provide the Owner with proof of payment of these taxes upon request.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 (Delete this subsection its entirety and replace with the following.)

The Contractor shall have exclusive responsibility for the coordination and scheduling of all Work on the Project. The Contractor shall, within fourteen (14) days of the execution of the Contract, prepare the master schedule for the Project consistent with the schedule that is Exhibit A to the Contract Agreement. The master schedule shall utilize a critical path method network analysis and shall be accompanied by a bar chart schedule based thereon. The schedules shall be updated on a monthly basis or at any time that the schedule has been significantly impacted by any cause. A copy of the current revised schedule shall be submitted by the Contractor to the Owner and Architect each month with a report. This monthly report shall include a brief narrative explaining each significant change in the schedule and identifying any item for which the Owner or Architect have responsibility which the Contractor asserts has or will act as constraint on the schedule.

The schedules are for the purpose of coordinating the timing, phasing and sequence of the Work and shall not change or modify the Date for Substantial Completion. The Date for Substantial Completion shall only be changed or modified by Change Order, other Modification or a Claim that is Finally Resolved, regardless of the date in a schedule.

3.12.6 (Delete this subsection its entirety and replace with the following.)

By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

(Add the following section.)

3.12.11 INSTRUCTIONS.

Unless otherwise expressly provided in the Contract Documents, the Contractor shall provide typed or printed instructions covering the operation and maintenance of each item of equipment furnished in a notebook submitted to the Architect for review and transmittal to the Owner. The instructions, as applicable, shall include the following:

- .1 Any schematic piping and wiring diagrams;
- .2 Any valve charts and schedules;
- .3 Any lubrication charts and schedules;
- .4 Guides for troubleshooting;
- .5 Pertinent diagrams and maintenance instructions for all equipment;
- .6 Manufacturer's data on all equipment;
- .7 Operating and maintenance instructions for all equipment, including any manufacturers' instructions, guidelines and/or requirements;
- .8 Manufacturer's parts list;
- .9 Any testing procedures for operating tests; and
- .10 Other instructions and materials as required by the Contract Documents.

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The Contractor shall provide two (2) copies of the above instruction books on or before the Substantial Completion of its Work. The books shall describe the information to be covered clearly and in detail and shall be in form and content satisfactory to the Architect and the Owner.

3.13 (Delete this paragraph in its entirety and replace with the following.)

Unless expressly permitted by the Contract Documents or by the Owner in writing, the Contractor shall comply with any rules, regulations and/or restrictions applicable to the use of the site, including any rules, regulations, and/or restrictions adopted by the Owner and/or Landlord. Additionally, unless authorized in writing by the Owner, the Contractor shall not interfere with the Owner's ongoing operations, shall not permit any of its employees or its Subcontractor's or materialmen's employees to use any existing facilities on the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas, and shall not permit its employees or its Subcontractor's or materialmen's employees to bring any tobacco products, alcoholic beverages, controlled substances, or firearms onto the Project site or any other property owned or controlled by the Owner. The Contractor shall not permit its employees or its Subcontractor's or materialmen's employees to use any radios, tape or compact disc players, or sound amplification equipment that is audible outside of the immediate area where the Work is being performed.

ARTICLE 4: ARCHITECT

4.1.3 (Delete this section.)

4.2.10 (Delete this section in its entirety and replace with the following.)

If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be consistent with these General Conditions.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1.3 (Delete this section in its entirety and replace with the following.)

The Contractor shall coordinate the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them.

ARTICLE 7: CHANGES IN THE WORK

(Add the following section.)

7.1.4 Any change order or change directive that will result in the cumulative amount of all Change Orders and Change Directives exceeding the Contract Sum by five percent (5%) or more, must be approved in writing by the Owner's Market Director of Construction, or a person higher than the Owner's Market Director of Construction in the Owner's organization, and the Owner's representative, the Contractor will not be paid for any changes, unless such changes are approved in writing by both the Owner's Market Director of Construction, or a person higher than the Owner's Market Director of Construction in the Owner's Organization, and the Owner's representative.

(Add the following section.)

7.2.2 The agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including but not limited to, all direct, indirect and cumulative costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time.

7.3.3.4 (Add at the end.)

; or

7.3.3.5 (Add the following subsection.)

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- .5 except where unit prices are applicable, that Contractor agrees and represents to the Owner for the Owner's reliance that all Change Order or Change Directive pricing submitted by the Contractor shall be based on the Contractor's actual costs or the Contractor's reasonable estimate of what would be its actual costs plus permitted overhead and profit.
- 7.3.7.4 (Delete "and" at the end.)
- 7.3.7.5 (delete "." at the end and add ";" at the end)
- 7.3.7.6 and 7.3.7.7 (Add the following subsections.)
- .6 Total overhead and profit for the Contractor and its Subcontractors on any add Change Order shall be a percentage of the total cost of labor and material, including all labor and material provided by Subcontractors as stated in the General Contractor's Master Service Agreement; and
- .7 Total overhead and profit for the Contractor and its Subcontractors on any deduct Change Order shall be a percentage of the total cost of labor and material, including all labor and material provided by Subcontractor as stated in the General Contractor's Master Service Agreement.

ARTICLE 8: TIME

- 8.3.1 (Delete "mediation and arbitration" and insert in its place "mediation, arbitration or litigation.")
- 8.3.3 (Delete this section in its entirety and replace with the following.)

To the fullest extent permitted by law, the Contractor agrees that its sole and exclusive remedy for delays, hindrances, interferences, acceleration and disruption caused by reasons outside of its control and without its fault or negligence shall be an extension of the Contract Time as set forth herein.

ARTICLE 9: PAYMENTS AND COMPLETION

- 9.3.1.3 and 9.3.1.4 (Add the following subsections.)

9.3.1.3 Until final payment, the Owner will pay ninety percent (90%) of the amount due to the Contractor on account of progress payments. If the manner of completion of the Work and its progress are and remain satisfactory to the Architect, and in the absence of other good and sufficient reasons, when the Project is shown to be 50% or more complete in the Application for Payment, the Architect may, without reduction of previous retainage, on presentation by the Contractor the Consent of its Surety, if applicable, certify remaining progress payments to be paid in full.

9.3.1.4 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Architect or if the Surety withholds its consent, or for other good and sufficient reasons.

- 9.3.3 (Add at the end.)

The Contractor agrees to bond off any lien filed on the real property on which the Project is located, the Owner's interest in such real property and/or the remaining balance of the Contract Sum. The Contractor shall do so within sixty (60) days of the filing of the lien.

- 9.5.1.6 (Delete "or" at the end.)
- 9.5.1.7 (Delete "." at the end and add ";" or" at the end.)
- 9.5.1.8 (Add the following subsection.)

- .8 the Contractor is in default of the performance of any of its obligations under another contract it has with the Owner.

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9.8.3 (Delete this section in its entirety and replace with the following)

Upon receipt of the Contractor's list and the documents required by Section 3.12.11 neatly bound and indexed, the Architect will make an inspection to determine whether the Work or designated portion thereof is Substantially Complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Work is Substantially Complete, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.3.1 (Add the following section.)

9.8.3.1 TIME FOR COMPLETION OF ITEMS ON LIST AND REMEDIES

The Contractor shall complete all items on the list accompanying the Architect's Certificate of Substantial Completion within forty-five (45) days of the Date of Substantial Completion shown in the Certificate. If the Contractor fails to do so, the Owner in its discretion and in addition to any other remedies available to it may perform the work by itself or others and the cost thereof shall be charged against the Contractor.

9.8.4 (Add "consistent with Section 9.8.3.1" before "shall fix the time.")

9.9.1 (Delete this section in its entirety and replace with the following.)

The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor and/or with the Architect's approval, provided such occupancy or use is consented to by the insurer as required under Section 11.21 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is Substantially Complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. In the event of a disagreement about such responsibilities, correction period, or commencement of warranties, the Architect will resolve the disagreement, and the Architect's decision will be final and binding. When the Contractor considers a portion Substantially Complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect, which shall be final and binding.

9.10.1 (Add as a new paragraph at the end.)

As a condition of Final Payment, for each minority, disadvantaged or small business, including subcontractors and materialmen, that the Contractor committed to hire for the Project, the Contractor shall deliver to the Owner a) a certificate establishing that the business was a minority, disadvantaged or small business during the Project, and b) lien releases showing the amounts paid to the business. The certificate shall be from the government authority having jurisdiction to approve or designate the business as minority disadvantaged or small business.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.2.3 (Add at the end.)

The Contractor shall be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein.

10.2.4 (Add at the end.)

The Contractor shall not bring any hazardous materials onto the Project site unless expressly required by the Contract Documents.

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10.2.8 (Add “(other than Work)” after “person or property”).)

10.3.3 (Delete this section.)

ARTICLE 11: INSURANCE AND BONDS (Delete Article 11 and replace with the following.)

ARTICLE 11: INSURANCE AND BONDS

11.1. CONSTRUCTION CONTRACTOR'S INSURANCE PROVISIONS

11.1.1 During the life of the Contract and for such additional time as may be required by the Contract Documents, the Contractor will provide, pay for, and maintain in full force and effect the insurance outlined herein for coverages at not less than the prescribed minimum limits of liability, covering the Contractor's activities, those of any and all subcontractors, or anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable.

11.2. CERTIFICATES OF INSURANCE

11.2.1 Before starting Work, the Contractor will give Owner a certificate of insurance completed by a duly authorized representative of their insurer and acceptable to the Owner certifying that at least the minimum coverages required herein are in effect and specifying that the liability coverages are written on an occurrence form and that the coverages will not be canceled, nonrenewed, or materially changed by endorsement or through insurance of other policy(ies) of insurance without 60 days advance written notice to Owner.

.1 Failure of Owner to demand such certificate or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence provided will not be construed as a waiver of Contractor's obligation to maintain such insurance.

.2 The acceptance of delivery by Owner of any certificate of insurance evidencing the required coverages and limits does not constitute approval or agreement by Owner that the insurance requirements have been met or that the insurance policies shown in the certificates of insurance are in compliance with the requirements.

.3 Owner will have the right, but not the obligation, to prohibit Contractor or any subcontractor from entering the Project or Site until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by Owner.

.4 If the Contractor fails to maintain the insurance as set forth here, Owner will have the right, but not the obligation, to purchase said insurance at Contractor's expense. In addition, Contractor's failure to maintain the required insurance may result in termination of this Contract at Owner's option.

.5 If any of the coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverage will be submitted with Contractor's final invoice.

11.3 INSURER QUALIFICATION

11.3.1 All insurance will be provided through companies authorized to do business in the state where the Project is located and having an A.M. Best's rating of at least of A VII or reasonably acceptable by Owner. In addition, certified copies of all insurance policies required will be provided to Owner within 10 days of Owner's written request for those copies.

11.4. INSURANCE PRIMARY

11.4.1 All coverages required of Contractor will be primary over any insurance or self-insurance program carried by Owner.

11.5 NO REDUCTION OR LIMIT OF OBLIGATION

11.5.1 By requiring insurance, Owner does not represent that coverage and limits will necessarily be adequate to protect Contractor. Insurance effected or procured by Contractor will not reduce or limit

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Contractor's contractual obligation to indemnify and defend Owner for claims or suits which result from or are connected with the performance of this Contract.

ADDITIONAL INSURED

11.6.1 To the extent commercially available at no additional cost, the policy or policies providing insurance as required, with the exception of professional liability (if applicable) and workers' compensation, will defend and include Owner, its parent and affiliates, Building Owner/Manager and their respective directors, officers, representatives, agents and employees, and Owner's architects and engineers as additional insureds on a primary basis for work performed under or incidental to this Contract. The form of the additional insured endorsement will be ISO CG 20 10 11 85 (Form B) or its equivalent. If the additional insured has other insurance applicable to the loss, it will be on an excess or contingent basis. The amount of Contractor's insurance will not be reduced by the existence of such other insurance. Additional insured status for JPMorgan Chase & Co. and any of its affiliates, subsidiaries, directors, officers, employees, agents or any other party required to be named as an additional insured under this agreement shall extend to the full limits of liability maintained by the Contractor/Supplier/Tenant or any other person required to provide such coverage, even if those limits of liability are in excess of those required by this agreement.

11.7 DURATION OF COVERAGE

11.7.1 All required coverages will be maintained without interruption during the entire term of this Contract plus an additional 3 years for products and completed operations coverage following final acceptance of the Work by Owner.

11.8 CONTINUOUS OPERATION

11.8.1 Construction Contractor's commercial general liability insurance policy must be endorsed to reflect the fact that Owner and any tenants will continue to operate business activities at the premises during activities of Contractor and that no property used in connection with Owner's and tenants' activities will be considered by Contractor's insurance company as being in the care, custody, or control of Contractor.

11.9 RETROACTIVE DATE AND EXTENDED COVERAGE REPORTING PERIOD

11.9.1 If any insurance required here is to be issued or renewed on a claims-made form as opposed to the occurrence form, the retroactive date for coverage will be no later than the commencement date of the Work and will state that in the event of cancellation or nonrenewal, the discovery period for insurance claims (tail coverage) will be at least 36 months.

11.10 SUBCONTRACTORS

11.10.1 By appropriate agreement, Contractor shall require each subcontractor, to the extent of the Work to be performed by such subcontractor, (i) to be bound to Contractor by the terms of the Contract Documents, (ii) to assume toward Contractor all of the obligations and responsibilities which Contractor, by these Contract Documents, assumes toward Owner, and (iii) grant to Contractor all of the rights which Contractor, by these Contract Documents, grants to Owner. Contractor shall require each subcontractor to enter into similar agreements with its subcontractors. Nothing contained in the Contract Documents shall create any contractual obligation between any subcontractor and Owner; provided, however, that each subcontract shall provide that Owner, at Owner's option, shall have the right to cause the subcontractor to perform for the benefit of Owner the remainder of the Work covered by such subcontract in the event that the Contract is terminated, so long as Owner shall have paid to Contractor all amounts then due such subcontractor and thereafter Owner continues to pay the amounts due such subcontractor as they come due.

11.11 JOINT VENTURES

11.11.1 If Contractor is a joint venture involving 2 or more entities, then each independent entity will satisfy the limits and coverages specified here or the joint venture will be a named insured under each policy specified.

11.12 WAIVER OF SUBROGATION

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11.12.1 Contractor will require all insurance policies in any way related to the Work and secured and maintained by Contractor to include clauses stating each underwriter will waive all rights of recovery, under subrogation or otherwise, against Owner, architect, and all tiers of contractors or consultants engaged by them. Contractor will require of subcontractors, by appropriate written agreements, similar waivers each in favor of all parties enumerated in this section.

11.13 COOPERATION

11.13.1 Contractor and Owner agree to fully cooperate, participate and comply with all reasonable requirements and recommendations of the insurers and insurance brokers issuing or arranging for issuance of the policies required here, in all areas of safety, insurance program administration, claim reporting and investigating and audit procedures.

11.14 ADJUSTMENT OF LOSSES

11.14.1 Any loss insured under the policies required here will be adjusted by Contractor and Owner, as their interests may appear; and made payable to Contractor as trustee for the insureds as their interests may appear; subject to the requirements of any applicable mortgagee clause Contractor, as trustee, and subject to the Owner's approval, will have the power to adjust and settle any loss with the insurers. The Contractor shall deposit the proceeds received in a separate account, which the Contractor shall distribute subject to the Owner's written approval. If the Owner objects to the adjustment or to the distribution, the dispute will be resolved under Sections 4.5 and 4.6 of the General Conditions, and the decision/award shall govern the distribution of the proceeds.

11.15 INSURANCE LIMITS AND COVERAGE

11.15.1 To the extent applicable, the amounts and types of insurance will conform to the minimum terms, conditions and coverages of Insurance Service Office (ISO) policies, forms and endorsements.

11.15.2 If Contractor has any self-insured retentions or deductible under any of the required coverages, the Contractor must identify on the certificate of insurance the nature and amount of such self-insured retentions or deductible and provide satisfactory evidence of financial responsibility for such obligations. All self-insured retentions or deductibles will be the Contractor's sole responsibility.

11.16 COMMERCIAL GENERAL LIABILITY

11.16.1 Contractor will maintain commercial general liability insurance covering all operations by or on behalf of Contractor on an occurrence basis against:

- .1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage;
- .5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 claims for bodily injury or property damage arising out of completed operations, which coverage shall be maintained for no less than two (2) years following final payment; and
- .8 claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

Such insurance will have the limits and coverages equal to or greater than the following:

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11.16.2 MINIMUM LIMITS:

- .1 \$1,000,000 each occurrence
- .2 \$2,000,000 general aggregate with dedicated limits per project site
- .3 \$2,000,000 products and completed operations aggregate

11.16.3 COVERAGES:

- .1 1986 (or later) ISO commercial general liability form (occurrence form)
- .2 Products and completed operations coverage maintained for at least 3 years
- .3 Blanket contractual liability (included in 1986 ISO form)
- .4 Broad form property damage (included in 1986 ISO form)
- .5 Severability of interest (included in 1986 ISO form)
- .6 Underground explosion and collapse coverage (included in 1986 ISO form)
- .7 Personal injury
- .8 Incidental medical malpractice (included in 1986 ISO form)
- .9 Specific waiver of subrogation
- .10 Joint venture as named insured
- .11 Additional insured endorsement

11.17 AUTOMOBILE LIABILITY

11.17.1 Contractor will maintain business auto liability covering liability arising out of any auto (including owned, hired and non-owned autos).

- .1 Minimum limits: \$1,000,000 combined single limit each accident
- .2 Coverages
 - .1 Additional insured endorsement
 - .2 Specific waiver of subrogation
 - .3 Contractual liability

11.18 WORKERS' COMPENSATION

11.18.1 Contractor will maintain workers' compensation and employer's liability insurance.

- .1 Minimum limits
 - .1 Workers' compensation - statutory limit
 - .2 Employer's liability:
 - .1 \$1,000,000 bodily injury for each accident
 - .2 \$1,000,000 bodily injury by disease for each employee
 - .3 \$1,000,000 bodily injury disease aggregate

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11.19 UMBRELLA/EXCESS LIABILITY

11.19.1 Contractor will maintain umbrella/excess liability insurance on an occurrence basis in excess of the underlying insurance described in Sections 16, 17 and 18 which is at least as broad as each and every one of the underlying policies. The amounts of insurance required in Sections 16, 17, 18 and 19 may be satisfied by Contractor purchasing coverage for the limits specified or by any combination of underlying and umbrella limits, so long as the total amount of insurance is not less than the limits specified in each of Sections 16, 17 and 18 when added to the limit specified in this Section 19.

- .1 Minimum limits: \$5,000,000 combined single limit and aggregate limit
- .2 Coverages

Additional insured endorsement

- .1 Pay on behalf of wording
- .2 Concurrency of effective dates with primary
- .3 Blanket contractual liability
- .4 Punitive damages coverages (where not prohibited by law)
- .5 Aggregates apply where applicable in primary
- .6 Care, custody, and control - follow form primary
- .7 Drop down feature

11.20 CONSTRUCTION CONTRACTOR'S POLLUTION LIABILITY

11.20.1 When remediation or abatement is included in the Work, Contractor will purchase a policy covering third-party injury and property damage claims, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. Completed operations coverage will remain in effect for no less than 3 years after final completion. Owner will be named as an additional insured and the policy will have a retroactive date before the start of the Work.

- .1 The limits of coverage will not be less than:
 - .1 \$1,000,000 each occurrence
 - .2 \$1,000,000 aggregate

11.21 PROPERTY INSURANCE

11.21.1 Unless otherwise provided, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" (Special Causes of Loss) or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.21.2 Property insurance shall be on an "all-risk" (Special Causes of Loss) or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

11.21.3 the Contractor does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Contractor shall so inform the Owner in writing

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prior to commencement of the Work. The Owner may then affect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Contractor. If the Contractor is damaged by the failure or neglect of the Contractor to purchase or maintain insurance as described above, without so notifying the Owner in writing, then the Contractor shall bear all reasonable costs properly attributable thereto.

11.21.4 If the property insurance requires deductibles, the Contractor shall pay all costs not covered because of such deductibles.

11.21.5 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work and materials in transit.

11.21.6 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.21.7 BOILER AND MACHINERY INSURANCE

The Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

11.21.8 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire, property damage, or any hazard, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire, property damage, or any hazards however caused.

11.21.9 If the Owner requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.

11.21.10 Cooperation by the Parties. The Owner and the Contractor shall fully cooperate with each other in connection with the collection of any insurance monies that may be due in the event of a loss. The Owner and the Contractor shall promptly execute and deliver such proofs of loss and other instruments, which may be required for the purpose of obtaining recovery of any such insurance monies.

11.22 PERFORMANCE BOND AND PAYMENT BOND

11.22.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract. The Bonds shall be in the form required by the Owner.

11.22.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2.1 (Delete this section in its entirety and replace with the following.)

In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract

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Documents, the Contractor shall correct it promptly and in not less than 30 days after receipt of written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner finds and recognizes that Work is not in accordance with the Contract Documents and fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within 30 days after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

12.3 (Add at the end.)

The acceptance of nonconforming Work by the Owner shall be by written Change Order, signed by the Owner's authorized representative. No person has authority to accept non-conforming Work except pursuant to such written Change Order.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 (Delete this section in its entirety and replace with the following.)

13.1 GOVERNING LAW, VENUE AND CONSENT TO JURISDICTION

The Contract Documents and their interpretation, validity, and performance shall be governed by the laws of the County where the respective Project that gives rise to the controversy is located, without regard to its conflicts of law principles. In the event any court of law of appropriate judicial authority shall hold or declare that the law of another jurisdiction is applicable, the Contract Documents shall remain enforceable under the laws of the appropriate jurisdiction. To the maximum extent permitted by law, the parties hereto agree that venue for any action in connection with the Contract Documents shall be proper in New York County, New York. Each party hereto consents to the jurisdiction of any local, state or federal court situated in such location and waives any objection that it may have pertaining to improper venue or forum non convenient to the conduct of any proceeding in any such court.

13.2.2 (Delete this section in its entirety and replace with the following.)

The Owner may, without consent of the Contractor, assign the Contract to another contractor if the other contractor assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

13.3 (Add "mail, overnight delivery" after registered".)

13.6 (Delete this section in its entirety and replace with the following.)

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the prime rate established by JPMorgan Chase Bank, NA.

(Add the following section.)

13.8 SAVINGS CLAUSE

13.8.1 If any one or more sections, clauses, sentences or parts of these Modified General Conditions shall for any reason be questioned in any court or in any arbitration and shall be adjudged unconstitutional or invalid, such judgment shall not affect, impair or invalidate the remaining provisions of these Modified General Conditions, but shall be confined in its operations to the specific provisions so held unconstitutional or invalid, and inapplicability or invalidity of any such section, clause, provision or part shall not be taken to affect or prejudice in any way the remaining part or parts of these Modified General Conditions.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.1.1.2 (Add "; or" at the end.)

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SECTION 007300 – SUPPLEMENTARY CONDITIONS

14.1.1.3 (Replace “; or” at the end with “.”.)

14.1.1.4 (Delete this subsection.)

14.4.2.1(Delete this subsection in its entirety and replace with the following.)

.1 cease all operations unless otherwise as directed by the Owner in the notice;

14.4.3 (Delete this section in its entirety and replace with the following.)

In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment only for Work executed (regardless of any certified or approved Payment Application), and out-of-pocket costs directly incurred by reason of such termination. Under no circumstances shall the Contractor or any of its Subcontractors (regardless of tier) be entitled to recover directly or indirectly any overhead or profit on Work not executed or any compensation for lost opportunities.

ARTICLE 15: CLAIMS AND DISPUTES

15.1.2 (Delete this section in its entirety and replace with the following.)

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker (and with a copy to the Architect if the Architect is not the Initial Decision Maker). Claims by either party must be initiated within 30 days after occurrence of the event giving rise to such Claim or within 30 days after the claimant first recognizes or should have recognized the condition giving rise to the Claim, whichever is later; except for the Owner's claims for defective and/or non-conforming Work. The Owner shall give the Contractor written notice of defective and/or non-conforming Work within three (3) years after the Owner first recognizes or should have recognized the condition giving rise to the Claim for defective and/or non-conforming Work, whichever is later. The Contractor shall initiate any Claims by giving written notice through the submission of a State of Claim Form to the Owner and the Initial Decision Maker within such 30 day period, properly completed in accordance with the instructions accompanying the Form. The Owner shall initiate any Claims by submitting a reasonably detailed description of the Claims to the Contractor and the Architect within the applicable time period.

15.1.6 (Delete this section in its entirety and replace with the following.)

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract as set forth below. This waiver includes:

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, and financing; and,
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

15.2.6.1(Delete this section in its entirety and replace with the following.)

Either party may within 30 days from the date of an initial decision demand in writing that the other party participate in the Dispute Resolution Procedures in Section 15.3. If such a demand is made and the other party does not give written notice to the other party that it will participate in such Dispute Resolution Procedures within 30 days of receipt of the demand, the initial decision shall become final and binding on the parties.

15.3 and 15.4 (Delete these sections in their entirety and replace with the following.)

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SECTION 007300 – SUPPLEMENTARY CONDITIONS

15.3 DISPUTE RESOLUTION PROCEDURES

If in accordance with Section 15.2.6.1, a party demands in writing that the other party participate in the Dispute Resolution procedure in Section 15.3, the parties shall each designate an executive officer or representative, who has no direct operational responsibility for the subject matter of the dispute, and who is authorized to investigate, negotiate, and settle the dispute.

If the disinterested officers are unable to settle the dispute through direct negotiation within 30 days (or an extended period if they so agree), the matter shall proceed to mediation with a mediator agreed upon by the parties (and if the Architect involved in the dispute, also the agreement of the Architect) from a list of mediators provided by the American Arbitration Association or as otherwise agreed by the parties (and the Architect). The parties agree to participate in the mediation in good faith, to endeavor to complete it within 60 days, and share equally (with such Architect) the mediator's fees and expenses.

In the event mediation is unsuccessful in resolving the dispute, then, at the sole discretion of Owner, the matter may proceed to arbitration under the Construction Industry Rules of the American Arbitration Association then in effect. Said arbitration shall be final and binding and judgment may be entered on any arbitration award. Should Owner in its sole discretion elect to not arbitrate the dispute, then any and all matters not resolved by mediation shall be resolved through litigation.

The Owner in its sole discretion may require the participation of the Architect involved in the Project giving rise to the dispute in any mediation, and/or the joinder of such Contractor in any arbitration should the Owner in its sole discretion elect to proceed to arbitration.

END OF SECTION

CHASE
SECTION 012000 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.2 RELATED SECTIONS

- A. 005000 – Agreement: Contract Sum.
- B. 007200 – General Conditions
- C. 007300 – Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- D. 012100 - Cash Allowances: Payment procedures relating to allowances.

1.3 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- D. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Present required information in typewritten form.
- E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.
- F. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- G. Execute certification by signature of authorized officer.
- H. Submit three copies of each Application for Payment.

CHASE
SECTION 012000 - PRICE AND PAYMENT PROCEDURES

- I. Include the following with the application:
 - 1. Partial release of liens from major Subcontractors and vendors.
 - 2. Application for payment will be rejected if the above items are not included.

1.5 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
- B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.
- C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change. Contractor shall prepare and submit a fixed price quotation within 5 days.
- E. Substantiation of Costs: Provide full information required for evaluation.
- F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- I. Promptly enter changes in Project Record Documents.

1.6 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 017000.
 - 2. All closeout submittals specified in Section 017800.
 - 3. Final Waivers of Lien attached to Final Payment Application.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CHASE
SECTION 012100 - CASH ALLOWANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building Permit Fees allowance.
- B. Utility Connection Fees allowance.
- C. Utility Expeditor allowance.
- D. Overexcavation/ Unforeseen Conditions allowance.
- E. Winter Conditions allowance.
- F. Generator Rental Fuel allowance.
- G. Keying allowance.
- H. Fire Alarm System allowance.
- I. Dumpsters and Laborer allowance.

1.2 RELATED SECTIONS

- A. Section 012000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 BUILDING PERMIT FEES ALLOWANCE.

- A. Costs assessed by governing municipality for the issuance of Construction Permit.
- B. At closeout of Contract, funds remaining in Permit Fees Allowance will be credited to Owner by Change Order.

1.4 UTILITY CONNECTION FEES ALLOWANCE.

- A. Costs assessed by governing utility and or municipality for utility tap on fees.
- B. At closeout of Contract, funds remaining in Connection Fees Allowance will be credited to Owner by Change Order.

1.5 UTILITY EXPEDITOR ALLOWANCE.

- A. Costs for expeditor to work with Agencies to obtain Electric, Gas, Telephone, and CATV services to the building as needed for the project.
- B. At closeout of Contract, funds remaining in Utility Expeditor Allowance will be credited to Owner by Change Order.

1.6 OVEREXCAVATION/UNFORSEEN CONDITIONS ALLOWANCE.

- A. Costs incurred for unforeseen field conditions involving removal and replacement of soils not suitable for bearing of paving or building elements at inadequate bearing soils location. Also included are unforeseen conditions uncovered during demolition.
- B. At closeout of Contract, funds remaining in Overexcavation Allowance will be credited to Owner by Change Order.

1.7 WINTER CONDITIONS ALLOWANCE.

- A. Costs incurred to provide heat and protection of work due to inclement winter conditions.
- B. At closeout of Contract, funds remaining in Winter Conditions Allowance will be credited to Owner by Change Order.

1.8 GENERATOR RENTAL/ FUEL ALLOWANCE.

- A. Costs incurred for supplying generator and fuel for the purpose of constructing building and electrical usage until permanent power is supplied by local power company.
- B. At closeout of Contract, funds remaining in Generator Rental/ Fuel Allowance will be credited to Owner by Change Order.

CHASE
SECTION 012100 - CASH ALLOWANCES

1.9 KEYING ALLOWANCE.

- A. Costs incurred for the replacement of temporary cylinders and the providing of new security cylinders and keys as outlined in FINAL KEYING ALLOWANCE in Section 087100 -Hardware.
- B. At closeout of Contract, funds remaining in Keying Allowance will be credited to Owner by Change Order.

1.10 FIRE ALARM SYSTEM ALLOWANCE.

- A. Costs incurred for the providing of fully functioning Fire Alarm System based on information shown on the electrical drawings and any additional requirements as directed by local Fire Protection Agency.
- B. At closeout of Contract, funds remaining in Fire Alarm System Allowance will be credited to Owner by Change Order.

1.11 DUMPSTERS AND LABORER ALLOWANCE.

- A. Costs for providing four 30 yard dumpster turnovers during Owner move-in, which includes debris from furniture installer. Also includes cost to provide one carpenter for one week (40 hours) during Owner move-in.
- B. At closeout of Contract, funds remaining in Dumpsters and Laborer Allowance will be credited to Owner by Change Order.

1.12 ALLOWANCES SCHEDULE

- A. See values for allowances on Form of Bid as provided by the owner.

END OF SECTION

CHASE
SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Alternate submission descriptions.

1.2 RELATED SECTIONS

- A. Owner-Contractor Agreement: Alternates accepted by Owner for incorporation into the Work.
- B. Sections of Specifications identified in each Alternate.

1.3 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.4 SCHEDULE OF ALTERNATES

- A. ALTERNATE NO. 1 - COST OF PERFORMANCE BOND:
 - 1. **Under Basic Bid:** Do not include Performance Bond in basic bid price.
 - 2. **Under Alternate:** Add to the Base Bid the cost of a Performance Bond. Chase reserves the right to require the bond at time of award of contract.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CHASE
SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Progress photographs.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.

1.2 RELATED SECTIONS

- A. 016000 – Product Requirements
- B. 017800 – Closeout Submittals

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

- A. Construction Manager will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
- C. Agenda:
 - 1. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 3. Scheduling.
 - 4. Scheduling activities of a Geotechnical Engineer.
- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.2 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Maintenance of progress schedule.
 - 7. Corrective measures to regain projected schedules.
 - 8. Planned progress during succeeding work period.

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.3 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. Submit updated schedule with each Application for Payment.

3.4 PROGRESS PHOTOGRAPHS

- A. Photography Type: Digital; electronic files.
- B. Provide a minimum of 10 digital photographs each week of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.
- C. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 2. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Structural framing in progress and upon completion.
 5. Enclosure of building, upon completion.
 6. Final completion, minimum of 10 photos.
- D. Views: Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
- E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format.
 1. Delivery Medium: email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.5 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800.

3.6 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

CHASE
SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

3.7 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record As-Built documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.

3.8 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus three copies that will be retained by Architect.
 - 2. Larger Sheets, Not Larger Than 36 x 48 inches: Submit the number of opaque reproductions that Contractor requires, plus three copies that will be retained by Architect.
- B. Documents for Information: Submit three copies.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect. Retained samples will not be returned to Contractor unless specifically so stated.

3.9 SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Form G810.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Deliver submittals to Architect at business address.
- F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Architect review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

END OF SECTION

CHASE
SECTION 014000 - QUALITY ASSURANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing and inspection services.
- B. Manufacturers' field services.

1.2 RELATED SECTIONS

- A. Section 003153 – Owner Paid Testing and Inspection Services
- B. Section 007200 – General Conditions: Inspections and approvals required by public authorities
- C. Section 013000 – Administrative Requirements: Submittal procedures.
- D. Section 016000 – Product Requirements: Requirements for material and product quality.

1.3 REFERENCES

- A. ASTM C 077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2006a.
- B. ASTM D 740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2004a.

1.4 SUBMITTALS

- A. Testing Agency: Prior to starting of work; Contractor shall communicate with Owner's Testing Agency. Contact: [TBD]
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor. Include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Location in the Project.
 - 7. Type of test/inspection.
 - 8. Date of test/inspection.
 - 9. Results of test/inspection.
 - 10. Conformance with Contract Documents.
 - 11. When requested by Architect, provide interpretation of results.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product but must be acceptable to Architect.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.5 TESTING AND INSPECTION AGENCIES

- A. [TBD] has been employed by the Owner to perform specified testing and inspection. General Contractor shall contact [TBD] for assigned technician name and contact information. Contractor shall be responsible for notifying testing agency of needed inspection/ testing site visits.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

CHASE
SECTION 014000 - QUALITY ASSURANCE

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- C. Testing/Inspection Agency Construction Testing/ Inspection Schedule includes site visits/ testing for Soil, Paving, Concrete, Steel, and Masonry as follows:
 - 1. Site grading: Minimum 2 site visits.
 - 2. Soil bearing capacity and concrete for footings: Minimum 3 site visits.
 - 3. Concrete for trench, cap, and foundation walls: Minimum one site visit.
 - 4. Concrete for floor slab: Minimum one site visit.
 - 5. Mortar for masonry: Minimum one site visit.
 - 6. Structural steel: Minimum 2 site visits.
 - 7. Parking/ driveway subgrade proof roll: Minimum one site visit.
 - 8. Concrete for aprons, curbs, and walks: Minimum 2 site visits.
 - 9. Concrete for drive thru islands: Minimum 2 site visits.
 - 10. Bituminous paving: Minimum 2 site visits.
- D. Limits on Testing/Inspection Agency Authority:
 - Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - Agency may not approve or accept any portion of the Work.
 - Agency may not assume any duties of Contractor.
- E. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel and provide access to the Work.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- G. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.2 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

CHASE
SECTION 014000 - QUALITY ASSURANCE

3.3 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

CHASE
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary telephone service.
- D. Temporary sanitary facilities.
- E. Temporary Controls: Barriers, enclosures, and fencing.
- F. Waste removal facilities and services.
- G. Project identification sign.

1.2 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. New permanent facilities may be used.

1.3 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. New permanent facilities may be used during construction operations.
- C. Maintain daily in clean and sanitary condition.
- D. At end of construction, return facilities to same or better condition as originally found.

1.5 FENCING

- A. Provide 6 foot high fence around construction site; equip with vehicular gates with locks.

1.6 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.7 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.8 PROJECT IDENTIFICATION

- A. Erect on site at location indicated.
- B. No other signs are allowed without Owner permission except those required by law.

CHASE

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

1.9 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CHASE
SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.2 RELATED SECTIONS

- A. 015000 – Temporary Facilities and Controls.

1.3 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- D. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
- E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25
- G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

- 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
 - J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - K. Open Water: Prevent standing water that could become stagnant.
 - L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- 1.4 SUBMITTALS**
- A. See Section 013000 - Administrative Requirements, for submittal procedures.
 - B. Erosion and Sedimentation Control Plan:
 - 1. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
 - 2. Obtain the approval of the Plan by authorities having jurisdiction.
 - 3. Obtain the approval of the Plan by Owner.
 - C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
 - D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Straw or hay.
 - 2. Erosion control matting or netting.
- B. Grass Seed for Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec⁻¹, minimum, when tested in accordance with ASTM D 4491.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
 - 4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
 - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.

CHASE

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- D. Silt Fence Posts: One of the following, minimum 5 feet long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet, minimum.
 2. Length: 50 feet, minimum.
 3. Provide at each construction entrance from public right-of-way.
 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet..
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.
6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
7. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
8. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Mulching Over Small and Medium Areas:

1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Erosion Control Matting: Comply with manufacturer's instructions.

D. Temporary Seeding:

1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.5 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

CHASE
SECTION 015713 - TEMPORARY EROSION AND SEDIMENT CONTROL

END OF SECTION

CHASE
SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General product requirements.
- B. Green-related product requirements.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations and procedures.
- F. Procedures for Owner-supplied products.
- G. Spare parts and maintenance materials.

1.2 RELATED SECTIONS

- A. Document 002113 - Instructions to Bidders: Product options and substitution procedures prior to bid date
- B. Section 014000 - Quality Requirements: Product quality monitoring.

1.3 REFERENCES

- A. GS-36 - Commercial Adhesives; Green Seal, Inc.; 2000.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 - PRODUCTS

2.1 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
 - 1. Made outside the United States, its territories, Canada, or Mexico.
- C. Urea-Formaldehyde Prohibition:
 - 1. Overall Project Requirement: Provide composite wood and agrifiber products having no added urea-formaldehyde resins.
 - a. Require each installer to certify compliance and submit product data showing product content.
 - 2. Specific Product Categories: Comply with limitations specified elsewhere.
- D. Adhesives and Joint Sealants:
 - 1. Definition: This provision applies to gunnable, trowelable, and liquid-applied adhesives,

CHASE
SECTION 016000 - PRODUCT REQUIREMENTS

- sealants, and sealant primers used anywhere on the interior of the building inside the weather barrier, including duct sealers.
 - 2. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
 - a. Require each installer to certify compliance and submit product data showing product content.
 - 3. Specific Product Categories: Comply with limitations specified elsewhere.
- H. Aerosol Adhesives:
- 1. Provide only products having lower volatile organic compound (VOC) content than required by GreenSeal GS-36.
 - a. Require each installer to certify compliance and submit product data showing product content.
 - 2. Specific Product Categories: Comply with limitations specified elsewhere.

2.2 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.3 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.1 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- E. Refer to Section 07200 – General Conditions of the Contract for Construction, Section 7.4 – Minor Changes in the Work for contractual qualifications for substitution requests.
- F. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

CHASE
SECTION 016000 - PRODUCT REQUIREMENTS

3. Submit completed 'Substitution Request Form'- refer to Section 006325.
4. The Architect will notify Contractor in writing of decision to accept or reject request.

3.2 OWNER-SUPPLIED PRODUCTS

- A. Contractor's Responsibilities:
 1. Coordinate with Project Construction Manager for all Owner supplied equipment, products and vendors.
 2. Review Owner reviewed shop drawings, product data, and samples. Coordinate with Project Construct Manager.
 3. Receive and unload products at site; inspect for completeness or damage jointly with Owner/ Project Construct Manager.
 4. Handle, store, install and finish products.
 5. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Prevent contact with material that may cause corrosion, discoloration, or staining.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

CHASE
SECTION 017000 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Cutting and patching.
- C. Surveying for laying out the work.
- D. Cleaning and protection.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures and Final Payout request.

1.2 RELATED SECTIONS

- A. Section 013000 - Administrative Requirements: Submittals procedures.
- B. Section 014000 - Quality Requirements: Testing and inspection procedures.
- C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- D. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.3 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.4 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Civil Engineer (or Architect, if no Civil is a part of the Project). Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.5 PROJECT CONDITIONS (as may be applicable)

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

SECTION 017000 - EXECUTION REQUIREMENTS

- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- G. Pest Control: Provide methods, means, and facilities to prevent pests, rodents, and insects from damaging the work.
- H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.6 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

CHASE
SECTION 017000 - EXECUTION REQUIREMENTS

3.3 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on Drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- I. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.4 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.5 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.
 - 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

CHASE

SECTION 017000 - EXECUTION REQUIREMENTS

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- D. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch as specified for patching new work.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- G. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
 3. Patch as specified for patching new work.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.

3.6 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-conforming work.
- D. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

CHASE
SECTION 017000 - EXECUTION REQUIREMENTS

- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.7 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.8 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.9 SYSTEMS STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed & functioning correctly.

SECTION 017000 - EXECUTION REQUIREMENTS

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.
- C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 230593.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are non-hazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Replace filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Notify Architect when work is considered ready for Substantial Completion.
- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- E. Notify Architect when work is considered finally complete.
- F. Complete items of work determined by Architect's final inspection.
- G. Submit Closeout Manuals, Warranties, As-Built Drawings, and other submittals designated in Section 017800.
- H. After Closeout Submittals are submitted and approved, submit Final Payment Request with all Final Waivers of Lien attached.

MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for 1 year from date of Substantial Completion.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

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SECTION 017000 - EXECUTION REQUIREMENTS

- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

END OF SECTION

CHASE
SECTION 017800 - CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.2 RELATED SECTIONS

- A. Section 007200 – General Conditions: Performance bond and labor and material payment bonds, warranty, and correction work.
- B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 017000 - Execution Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Provide one set of equipment manuals on site, no later than 30 days after equipment approval, to insure manuals are available during owner training.
 - 4. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 5. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. Date of Substantial Completion for Warranty Start Date shall be Date of Turnover, or Date of Certificate of Occupancy, which ever is later.
 - 4. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.

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SECTION 017800 - CLOSEOUT SUBMITTALS

5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.
- G. Project Record Documents (as-built drawings) – To Owner / Architect
 1. Contractor to submit within 30 days of project Substantial Completion and prior to Final Completion.
 2. The Contractor's original and complete set of Redlined Drawings including all as-built information shall be copied into 3 complete printed and one scanned on usb flash drives. The original As-Built Drawing, with Contractor's mark-ups, shall be sent to the Architect.
 3. Contractor shall submit one (1) full set of the As-Built Drawings scanned on usb flash drive to the Owner's Designated Representative (Project Manager) with a copy of the transmittal letter sent to the Architect containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.
 4. The final full set of As-Built Drawings shall be placed into a section of 6" PVC pipe and securely mounted to the wall in the Data Room. Include screw-on caps to the pipe, and clearly label the pipe "As-Built Drawings".
 5. All copied drawings, specifications, and O&M manuals to be presented to the Facility Manager (FM) and to be left in the Data Room as specified. For FM contact for specific region, contact Chase Project Manager.

3.2 OPERATION AND MAINTENANCE DATA (Submit within 30 days of Substantial Completion)

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- E. The Contractor's Original O&M Manual(s) shall be copied into electronic portable document format (.pdf) and placed on a usb flash drive. The original O&M Manual(s) shall be delivered to the site and placed in the Data Room.
- F. Contractor shall submit two (2) copies of the usb flash drive containing the O&M Manual in electronic (.pdf) format to the Architect with a copy of the transmittal letter to Owner's Designated Representative (Project Manager) containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

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- G. The electronic O&M Manual files shall be indexed or bookmarked in the same manor as the binder delivered to the site.
- H. Label usb flash drive with project name, location, completion date, and financial center number.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- I. Include test and balancing reports.
- J. Additional Requirements: As specified in individual product specification sections.

3.5 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 by 11-inch, three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings. Provide a minimum of 2 binders per project.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24-pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

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- I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of: Architect, Contractor, Subcontractors, and major equipment suppliers.
 - a. Architect, Contractor, Subcontractors, and major equipment suppliers.
 - b. Landlord/ Developer/ Municipal Contact information.
 - c. Copies of Building Permits, any Inspection Cards, Municipal Inspection Forms & Reports, and Certificate of Occupancy.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data. Include in this group:
 - 1) Masonry Type and information.
 - 2) EIFS and other Exterior systems.
 - 3) Roofing.
 - 4) Joint sealants.
 - 5) Storefront & Curtain Wall.
 - 6) Doors, Hardware and Locks. Including Push Button locks used.
 - 7) Ceilings.
 - 8) Flooring.
 - 9) Appliances, Refrigerator & Microwave.
 - 10) HVAC systems and equipment including Test & Balance Reports.
 - 11) Plumbing, including fixtures and toilet accessories.
 - 12) Fire Protection, sprinkler systems and/ or fire panel information.
 - 13) Interior lighting.
 - 14) Other items included in the project.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photocopies of warranties and bonds.
- J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.6 WARRANTIES AND BONDS

- A. Special Warranty: Non-prorated, non-transferable, 50-year limited warranty against defective raw materials and defects in manufacturing
 - 1. Include warranty against color change due to normal atmospheric conditions that exceed the limits established by ASTM D 4726
- B. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- C. Verify that documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Retain warranties and bonds until time specified for submittal.

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- F. Manual: Bind in commercial quality 8-1/2 by 11-inch, three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- J. Include warrantees for the following items and follow the format and order as it is given here:
 - 1. SOLID SURFACING FABRICATIONS
 - a. Window Sills, and Other Flat Items: Manufacturer's standard ten-year limited warranty on defective materials.
 - 2. EXTERIOR INSULATION AND FINISH SYSTEM
 - a. Provide manufacturer's labor and material warranty:
 - 1) Warranty period: 15 years.
 - 3. THERMOPLASTIC MEMBRANE ROOFING
 - a. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
 - b. Limit of liability: No Dollar Limitation. Scope of coverage shall be to repair any leak in the TPO roofing system caused by the ordinary wear and tear of the elements, manufacturing defect in system's Manufacturer's brand materials, and the workmanship used to install these materials, and cuts and punctures caused by rooftop service and maintenance activities.
 - c. Correct defective Work within a two-year period after Date of Substantial Completion.
 - d. Provide 20-year manufacturer's material and labor warranty to cover failure to prevent penetration of water. Warranty shall include membrane, roof insulation and membrane accessories.
 - 4. ASPHALT FIBERGLASS SHINGLES
 - a. Warranty: 50-year limited warranty plus 5-year, full labor and material, SureStart warranty.
 - 5. ALUMINUM COMPOSITE WALL PANELS
 - a. Warranty Period: Twenty years, commencing on Date of Substantial Completion.
 - 6. JOINT SEALANTS
 - a. Correct defective work within a five-year period after Date of Substantial Completion.
 - b. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.
 - 7. FLUSH WOOD DOORS
 - a. Provide warranty for the following term:
 - 1) Interior Doors: Life of installation.
 - b. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
 - 8. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
 - a. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
 - b. Correct defective Work within a five-year period after Date of Substantial Completion.
 - c. Provide five-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
 - d. Provide 10-year manufacturer warranty against degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
 - 9. DOOR HARDWARE
 - a. All exit devices shall carry manufacturer's one-year warranty.
 - b. All door closers shall carry a ten-year 10-year warranty.

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- c. To maintain warranties and preserve fire-ratings, fasteners used for installation are to be those provided with respective hardware items by hardware manufacturer. Self-drilling, self-tapping "TEK" screws are not to be used for any item of hardware unless packaged with hardware item by manufacturer.
- 10. GLAZING
 - a. Provide a 5-year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
 - b. Provide a 5-year warranty to include coverage for delamination of laminated glass and replacement of same.
- 11. RESIDENTIAL EQUIPMENT
 - a. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - b. Provide 5-year manufacturer warranty on refrigeration system of refrigerators.
 - c. Provide 10-year manufacturer warranty on magnetron tube of microwave ovens.
- 12. MECHANICAL PROVISIONS
 - a. Each Contractor shall and hereby does guarantee and warranty all work and material performed and installed by him directly or by any of his subcontractors against defective and inferior materials and workmanship for a period of one (1) year from the date of acceptance. All guarantees shall be in writing and delivered to the Owner before final certificates are issued. Contractor shall make good at his own expense and without cost of the Owner and all defective and inferior materials and workmanship that develop within the guarantee period
- 13. CONDENSING UNITS
 - a. Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
 - b. Warranty Period: 5 years from date of substantial completion.
- 14. ROOFTOP HEATING AND COOLING UNITS
 - a. Warranty of compressor and heat exchanger
 - 1) Provide written warranty, signed by manufacturer, agreeing to replace or repair, within warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provide manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
 - 2) Warranty Period: 5 years from date of substantial completion.
- 15. FIRE ALARM AND DETECTION SYSTEM
 - a. Warranty service for the equipment shall be provided by the system supplier's factory trained representative during normal working hours, Monday through Friday, excluding holidays. Emergency service provided at times other than as stipulated above shall be available from the same source at additional cost to the owner.

END OF SECTION

CHASE
SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.2 RELATED SECTIONS

- A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

- A. See Section 013000 – Administrative Requirements for submittal procedures.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit not less than four weeks prior to start of training.
 - 2. Revise and resubmit until acceptable.
 - 3. Provide an overall schedule showing all training sessions.
 - 4. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Training Reports:
 - 1. Identification of each training session, date, time, and duration.
 - 2. Sign-in sheet showing names and job titles of attendees.
 - 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

CHASE
SECTION 017900 - DEMONSTRATION AND TRAINING

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- D. Provide training in minimum two hour segments.
- E. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- F. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- G. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.
- H. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

CHASE
SECTION 018119 - INDOOR AIR QUALITY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.
- B. Building flush-out after construction and before occupancy.
- C. Testing indoor air quality after completion of construction.

1.2 PROJECT GOALS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.3 RELATED SECTIONS

- A. Division 23 - Heating, Ventilating and Air Conditioning: HVAC filters; testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.

1.4 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. Do not store construction materials or waste in mechanical or electrical rooms.
- D. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 - 3. Clean tops of doors and frames.

CHASE
SECTION 018119 - INDOOR AIR QUALITY

4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last, after cleaning is complete.
- E. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- F. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.2 BUILDING FLUSH-OUT

- A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.
- B. Perform building flush-out before occupancy.
- C. Do not start flush-out until:
1. All construction is complete.
 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 4. New HVAC filtration media have been installed.
- D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.
 2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
 3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
 4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
 - a. Begin ventilation at least three hours prior to daily occupancy.
 - b. Continue ventilation during all occupied periods.
 - c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.
- E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

END OF SECTION

CHASE
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Under slab vapor barrier.
- D. Concrete foundation walls.
- E. Concrete reinforcement.
- F. Joint devices associated with concrete work.
- G. Concrete curing.

1.2 RELATED SECTIONS

- A. 033505 – Curing, Sealing and Hardening Concrete Floors.
- B. 079200 - Joint Sealants.

1.3 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
 - 2. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
 - 3. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (errata 2007).
 - 4. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
 - 5. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.
 - 6. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988 (Reapproved 2002).
 - 7. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001.
 - 8. ACI 315 - Details and Detailing of Concrete Reinforcement; American Concrete Institute International; 1992
 - 9. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2008.
- B. American Society for Testing and Materials (ASTM)
 - 1. A185/A 185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2006.
 - 2. A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.
 - 3. C33 - Standard Specification for Concrete Aggregates; 2003.
 - 4. C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2005.
 - 5. C94/C94M - Standard Specification for Ready-Mixed Concrete; 2007.
 - 6. C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2005a.
 - 7. C150 - Standard Specification for Portland Cement; 2005.
 - 8. C171 - Standard Specification for Sheet Materials for Curing Concrete; 2003.
 - 9. C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2001.
- C. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.
- D. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2006.
- E. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2005a.

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SECTION 033000 - CAST-IN-PLACE CONCRETE

- F. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2002.
- G. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999.
- H. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2007.
- I. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types); 2004.
- J. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 1997 (Reapproved 2004).

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.
- C. Samples: Submit samples of underslab vapor retarder to be used.
- D. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.5 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 3. Form Ties: Flat tie type that will leave no metal within 1/2 inches of concrete surface.

2.2 REINFORCEMENT

- A. Reinforcing Steel: Deformed billet-steel bars; ASTM A 615/A 615M Grade 60 (420).
- B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Conform to Concrete Reinforcing Steel Institute Manual of Standard Practice.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type I - Normal portland type.
- B. Fine and Coarse Aggregates: ASTM C 33. Use recycled aggregates as available.
- C. Slag: ASTM C-989
 - 1. Provide 50% Max pound for pound cement replacement.
 - 2. Check with concrete provider for information on amount of curing time required.

CHASE
SECTION 033000 - CAST-IN-PLACE CONCRETE

3. Maintain PSI requirements per concrete mix design.

D. Water: Clean and not detrimental to concrete.

2.4 CHEMICAL ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C 260.

C. Water Reducing and Accelerating Admixture: ASTM C 494/C 494M Type E.

D. Water Reducing and Retarding Admixture: ASTM C 494/C 494M Type D.

E. Water Reducing Admixture: ASTM C 494/C 494M Type A.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: 15 mil Stego Wrap, or approved; maximum 0.012 perms; multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.

B. Non-Shrink Grout: ASTM C 1107/C 1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

C. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

D. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.6 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-dispersible acrylic latex, complying with ASTM C 1059 Type II.

B. Epoxy Bonding System: Complying with ASTM C 881/C 881M and of Type required for specific application.

C. Joint Filler: Non-extruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D1751, 1/2 inch thick and full depth of slab less 1/2 inch.

D. Construction Joint Devices: Integral extruded plastic; 1/4 inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

2.7 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

C. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 4,000 psi. except at interior floor slabs which should be 3500 psi and exterior slabs which should be 4000 psi.
2. Slag 50% maximum pound for pound cement replacement.
3. Check with concrete provider for information on amount of curing time required.
4. Use recycled aggregates as available.
5. Cement Content: Minimum 564 lb per cubic yard.
6. Water-Cement Ratio: Maximum 40 percent by weight.
7. Total Air Content: 4 to 6 percent, determined in accordance with ASTM C 173/C 173M.
8. Maximum Slump: 3 inches.

2.8 MIXING

Transit Mixers: Comply with ASTM C 94/C 94M.

CHASE
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- D. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

3.3 INSTALLING REINFORCEMENT

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.
- F. Separate slabs on grade from vertical surfaces with joint filler.
- G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.
- I. Install joint devices in accordance with manufacturer's instructions.
- J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- K. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.
- L. Screed slabs on grade level, maintaining surface flatness of maximum 1/8 inch in 10 ft.

3.5 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.

CHASE
SECTION 033000 - CAST-IN-PLACE CONCRETE

- B. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Steel trowel surfaces that will receive carpeting, resilient flooring, and thin set ceramic tile.
 - 2. Steel trowel surfaces that will be left exposed.
 - 3. Medium broom surfaces that are exterior to the building.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.6 CURING AND PROTECTION

- A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.
- C. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-fog spray, or saturated burlap.
 - 3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
 - b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer. Use curing compound or moisture-retaining cover in areas to receive finish flooring. Remove curing compound residue before installation of finish flooring. Refer to Section 033505 – Curing, Sealing and Hardening Concrete Floors.

3.7 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests as specified in Section 014000.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design to testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.8 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

CHASE
SECTION 033000 - CAST-IN-PLACE CONCRETE

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single application cure-seal-hardener for new concrete floors.

1.2 RELATED SECTIONS

- A. 033000 – Cast-in-Place Concrete: Concrete slabs.

1.3 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Manufacturer's data sheets, including product specifications, test data, preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.
- C. Maintenance instructions, including precautions for avoiding staining after application.

1.4 PROJECT CONDITIONS

- A. No satisfactory procedures are available to remove petroleum or rust stains from concrete. Prevention is therefore essential. Take precautions to prevent staining of concrete prior to application of cure-seal-hardener and for minimum of three months after application:
 - 1. Prohibit pipe cutting using pipe cutting machinery on concrete slab.
 - 2. Prohibit temporary placement and storage of steel members on concrete slab.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Curecrete Distribution, Inc; (Springville, UT; 800-998-5664; email: techsupport@ashfordformula.com. www.ashfordformula.com)
- B. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

- A. Cure-Seal-Hardener: Ashford Formula; water-based chemically reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through, but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.
 - 1. Colorless, transparent, odorless, non-toxic, non-flammable.
 - 2. Containing no solvents or volatile organic compounds.
 - 3. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.
 - 4. No change to surface appearance except a sheen developed due to traffic and cleaning.
- B. Water: Clean, potable.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Prevent damage to and soiling of adjacent work.

CHASE

SECTION 033505 - CURING, SEALING, AND HARDENING CONCRETE FLOORS

- C. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling, except on colored concrete wait minimum of 30 days.
1. Spray on at rate of 200 square feet per gallon.
 2. Keep surfaces wet with cure-seal-hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30-minute time period has elapsed. If that occurs, apply more cure-seal-hardener as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state.
 3. After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears.
 4. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal-hardener.
 5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
 6. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.

END OF SECTION

CHASE
SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete Block.
- B. Clay Facing Brick.
- C. Mortar and Grout.
- D. Reinforcement and Anchorage.
- E. Flashings.
- F. Accessories.

1.2 RELATED SECTIONS

- A. 047215 – Architectural Cast Stone.
- B. 055000 – Metal Fabrications: Loose steel lintels.
- C. 061000 – Rough Carpentry: Nailing strips built into masonry.
- D. 079200 – Joint Sealants: Backing rod and sealant at control and expansion joints.

1.3 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; latest edition.
 - 2. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; latest edition.
- B. American Society for Testing and Materials (ASTM)
 - 1. A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; latest edition.
 - 2. A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; latest edition. A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; latest edition.
 - 3. A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; latest edition.
 - 4. C90 - Standard Specification for Loadbearing Concrete Masonry Units; latest edition.
 - 5. C91 - Standard Specification for Masonry Cement; latest edition.
 - 6. C144 - Standard Specification for Aggregate for Masonry Mortar; latest edition.
 - 7. C150 - Standard Specification for Portland Cement; latest edition.
 - 8. C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay) ; latest edition.
 - 9. C270 - Standard Specification for Mortar for Unit Masonry; latest edition.
 - 10. C404 - Standard Specification for Aggregates for Masonry Grout; latest edition.
 - 11. C476 - Standard Specification for Grout for Masonry; latest edition.
 - 12. C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; latest edition.
- C. IMIABC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; latest edition.
- D. IMIABC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.

CHASE
SECTION 042000 - UNIT MASONRY

- C. Samples: Submit four samples of facing brick units of each color to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C 90, normal weight.

2.2 BRICK UNITS

- A. Face brick
 - 1. Manufacturer: Acme Brick, www.brick.com.
 - 2. Product: Denton 150, Red Sunset.
 - 3. Manufactured in compliance with ASTM C216, Type FBS, Grade SW.
 - 4. Color and texture: As shown on architectural drawings.
 - 5. Nominal size: Modular brick 7-5/8" x 2-1/2" x 3-5/8" as indicated on drawings.
 - 6. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
 - 7. Mortar color: natural.
 - 8. Substitutions: refer to Section 016000.

2.3 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91, Type S.
- B. Portland Cement: ASTM C 150, Type I.
 - 1. Grout Aggregate: ASTM C 404.
- C. Water: Clean and potable.
- D. Accelerating Admixture: Non-chloride type for use in cold weather.
- E. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.4 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers of Joint Reinforcement and Anchors:
 - 1. Dur-O-Wal: www.dur-o-wal.com.
 - 2. Hohmann & Barnard, Inc: www.h-b.com.
 - 3. Substitutions: refer to Section 016000.
- B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars; uncoated.

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- C. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 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.
- D. Multiple Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 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.
- E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage. Product example Hohmann & Barnard "X-Seal".
 - 2. Wire ties: Product example Hohmann & Barnard "Vee Wire Ties" wire shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 2 inches.

2.5 FLASHING

- A. Rubberized asphalt sheet membrane and accessory materials: as indicated in Section 076526 – Self-Adhering Sheet Flashing.
- B. Stainless steel drip edge: as indicated in Section 076200 – Flashing and Sheet Metal Trim.

2.6 ACCESSORIES

- A. Control joint sealant, backer rod and bond breaker: as indicated in Section 079200 – Joint Sealants.
- B. Cavity wall air space mortar dropping collection device to hold mortar droppings above the cavity base and maintain open cavity weeps.
 - 1. Material: min. 90% open polyester or nylon mesh trapezoidal mats.
 - 2. Install in thicknesses and layers as required to fully fill the cavity.
 - 3. Manufacturers, products
 - a. Mortar Net USA, Inc., www.mortarnet.com, MortarNet.
 - b. Substitutions: refer to Section 016100.
- C. Weeps: base course head joint materials designed to draw moisture from the cavity to the exterior.
 - 1. Material: min. 90% open polyester or nylon mesh rectangular mats.
 - 2. Size: cut to fill modular brick base course, full wythe and width.
 - 3. Color: match mortar color.
 - 4. Manufacturers, products
 - a. Mortar Net USA, Inc., www.mortarnet.com, WeepVent.
 - b. Substitutions: refer to Section 016100.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.7 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
 - 1. Exterior, non-loadbearing masonry: Type S.
 - 2. Plain non-colored.
- B. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.

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- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

3.4 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Refer to elevation drawings and structural wall specifications for coursing and details.
- D. Strike all mortar joints concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners, except for units laid in stack bond.
- E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.6 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 24 inches on center horizontally above through-wall, lintel and base flashing.

3.7 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Lap joint reinforcement ends minimum 6 inches.
- D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 24 inches horizontally and 16 inches vertically.

3.9 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.

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- B. Extend sheet membrane flashings to within 1/4 inch of exterior face of masonry and provide stainless steel drip edge to exterior face of masonry and turn down to form drip.

3.10 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 8 inch bearing on each side of opening.
- C. Leave horizontal masonry joints open at lintel bearing ends and control joint sealant, backer and bond breaker.

3.11 CONTROL JOINTS

- A. Do not continue horizontal joint reinforcement through control joints.
- B. Control joints shall extend continuously from top of foundation to top of masonry.

3.12 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.15 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000.
- B. Mortar Tests: Test each type of mortar in accordance with ASTM C 780, testing with same frequency as masonry samples.

3.16 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

3.17 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

CHASE
SECTION 047215 - ARCHITECTURAL CAST STONE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Architectural cast stone; application on exterior walls.

1.2 RELATED SECTIONS

- A. 079200 – Joint Sealants: Materials and execution methods for sealing soft joints in cast stone work; control joints.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C90: Standard Specification for Loadbearing Concrete Masonry Units; latest edition.
 - 2. ASTM C140: Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; latest edition.
 - 3. ASTM C270: Standard Specification for Mortar for Unit Masonry; latest edition.
 - 4. ASTM C666: Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing; latest edition.
 - 5. ASTM C 1148: Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; latest edition.
 - 6. ASTM C1194: Standard Test Method for Compressive Strength of Architectural Cast Stone; latest edition.
 - 7. ASTM C1195: Standard Test Method for Absorption of Architectural Cast Stone; latest edition.
 - 8. ASTM C 1314: Standard Test Method for Compressive Strength of Masonry Prisms; latest edition.
 - 9. ASTM C 1357: Standard Test Methods for Evaluating Masonry Bond Strength; latest edition.
 - 10. ASTM C1364: Standard Specification for Architectural Cast Stone; latest edition.
 - 11. ASTM E 514: Standard Test Method for Water Penetration and Leakage Through Masonry; latest edition.
- B. ACI 301: Specifications for Structural Concrete; American Concrete Institute; latest edition.
- C. National Concrete Masonry Association
 - 1. NCMA TEK Bulletin #8-02A: Removal of Stains from Concrete Masonry
 - 2. NCMA TEK #8-03A: Control and Removal of Efflorescence

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Submit for fabricated wire reinforcement and each type of stone specified. Include all applicable physical and performance data.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors and piece numbers.
- D. Samples: Submit 2 12 in. x 12 in. samples of simulated stone units to illustrate color, texture, and size range of each type unit.
- E. Mortar Color Selections Samples.
- F. Manufacturer's detailed installation instructions.
- G. Test Reports prepared by a qualified independent laboratory indicating compliance with the performance requirements for integral mortar water repellency as tested using:
 - 1. ASTM E 514-74.
 - 2. ASTM C 1357.
 - 3. ASTM C 1314.
 - 4. ASTM C 1148.
- H. List of projects on which manufacturer has supplied simulated stone materials in the past 5 years

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SECTION 047215 - ARCHITECTURAL CAST STONE

- I. Certification listed in Quality Assurance article of Part 1 this Section.

1.5 FIELD SAMPLES

- A. Sample Installation: Construct stone wall at job site 3 feet x 4 feet in size, including mortar, special shapes, bonding, joint work, reinforcement, moisture barrier, grouting, corbelling, mortar color, expansion, control joints, and accessories.
 - 1. Obtain Architect's approval before beginning work. Protect and retain sample as a basis on which the quality of the work will be judged. Do not remove until Substantial Completion.
 - 2. Accepted Field Sample: May not remain as part of completed Work.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A current manufacturing member of Illinois Concrete Products Association manufacturing cast stone products for over 5 years.
- B. Installer: Minimum 5 years experience in similar types of work of similar scope and be able to furnish list of previous jobs and references if requested by Architect.
- C. Expansion Joints: Provide expansion joints as indicated on Drawings or, if not indicated, install at frequency and in accordance with details and as recommended by manufacturer. Confirm locations and frequency with Architect before beginning work.
- D. Certifications:
 - 1. Provide written documentation that products have met or exceeded at least one of the following certifications for a minimum of 10 years:
 - a. ICBO - International Conference of Building Officials;
 - b. SBCCI - Southern Building Code Congress International;
 - c. BOCA - Building Officials and Code Administrators International; or
 - d. ICC - International Code Council
 - 2. Provide written documentation that stone products comply with specified minimum criteria when tested in accordance with testing standards specified in Part 2 of this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Store cast stone components on pallets with non-staining waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- C. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- D. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

1.8 WARRANTY

- A. Special Warranty: Prepare and submit in accordance with Section 01780.
 - 1. Provides 50-year limited warranty against manufacturing defects in manufactured stone products.

PART 2 - PRODUCTS AND MATERIALS

2.1 ARCHITECTURAL CAST STONE

- A. Nominal 12" x 24" x 1" high-density, severe weathering, limestone screening dry tamp simulated stone masonry unit w/ Portland cement and water penetration resistance admixture compliant with ASTM C1364.
 - 1. Compressive strength: Min. 6500 psi at 28 days per ASTM C1194.
 - 2. Absorption: max. 6% at 28 days per ASTM C1195.
 - 3. Density: min. 125 lb/cu. ft. per ASTM C125.
 - 4. Freeze-thaw resistance: max. 5% at 300 cycles per ASTM C666.

CHASE

SECTION 047215 - ARCHITECTURAL CAST STONE

5. Field material surface texture: Smooth face texture with no bugholes, air voids or other surface blemishes visible from a distance of 20 feet.
 6. Color: country beige and French white (random field mix 50/50)
 7. Reinforcement and anchorage: provide reinforcement as required to withstand handling and structural stresses; comply with ACI 301.
 8. Special shapes as indicated on drawings.
- B. Manufacturer, product
1. Coronado stone products, www.coronado.com, French limestone.
 2. Substitutions: refer to Section 016000.
- C. Stimulated Stone:
1. Precast simulated stone, composed of following materials:
 - a. Portland Cement: ASTM C 150, Type 1, 2, or 3 depending upon color to be produced.
 - b. Course Aggregates: ASTM C 330, lightweight type, color as necessary to obtain final approved color of stone.
 - c. Sand: ASTM C 144, special color if required to match approved sample.
 - d. Water: Clean and free from deleterious substances.

2.2 MORTAR

- A. Portland cement-lime with water-repellant admixture, compliant with ASTM C270, Type S.
- B. Pigments: Meeting ASTM C 979, mineral oxide type.
1. Mortar Color: To match Simulated Stone Veneer as manufactured by Coronado Stone Products
- C. Water: Potable.
- D. Mixing: Use thinset with acrylic additive in accordance with thinset manufacturer's recommendation.
1. Thoroughly mix mortar and grout ingredients in quantities needed for immediate use. Mix grout to ASTM C 270, Type S proportions and mortar to ASTM C 270, Type S requirements.
 2. Do not use anti-freeze compounds to lower freezing point of mortar.
- E. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.
1. Power washing is not permitted.

2.3 RELATED MATERIALS

- A. Setting Accessories:
1. Moisture Barrier:
 - a. ASTM D226, No.15 non-perforated asphalt saturated organic felt.
 2. Metal Lath: ASTM C 847; 18 gage, galvanized, flat diamond mesh, self-furring, stamped sheet; 2.5.
 - a. Attachment: Galvanized nails, screws and other metal supports, of type and size to suit applications; to rigidly secure materials in place.
 3. Joint Sealant: Refer to Section 079200.
 4. Fasteners: Coated 1-1/2 inch nails, staples, or screws of type and for spacing as recommended by simulated stone manufacturer.

2.4 WATER-REPELLANT MORTAR ADMIXTURE

- A. Integral liquid polymeric admixture for mortar added during mixing.
- B. Performance and testing requirements
1. Water permeance: ASTM E514, minimum Class E rating.
 2. Flexural bond strength: ASTM C1357, no statistically lower masonry flexural bond strength.
 3. Compressive strength: ASTM C1314, no statistically lower compressive strength of prisms.
 4. Drying shrinkage of mortar: ASTM C1148, no statistically higher drying shrinkage.
- C. Manufacturer, product
1. ADM Chemistries, Inc., www.acmchem.com, Rainbloc.

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SECTION 047215 - ARCHITECTURAL CAST STONE

2. Substitutions: refer to Section 016000.

PART 3 - PART 3 EXECUTION

3.1 INSTALLATION

- A. Examination: Examine conditions and proceed with work in accordance with Section 01400.
 - 1. Verify that field conditions are acceptable and are ready to receive work.
 - 2. Verify items provided by other Sections of work are properly sized and located.
 - 3. Verify that built-in items are in proper location and ready for roughing into masonry work.
 - 4. Verify correct product prior to installation.
 - 5. Consult Owner and manufacturer if deficiencies exist. Correct deficiencies in accordance with stone manufacturer's recommendations.
- B. Protect surrounding area from possible damage during installation work.
- C. Initiating installation constitutes Installer's acceptance of existing surfaces and substrate.
- C.1 Installer shall use only mortar containing integral water-repellent mortar admixture at the manufacturer's recommended addition rate and mixed according to the manufacturer's recommended instructions.

3.2 APPLICATION

- A. Moisture Barrier:
 - 1. Apply sheets horizontally, starting at the base of the wall, and lapping each successive upper sheet over the previous lower sheet.
 - 2. Lap horizontal and vertical joints 6 inches.
 - 3. Cut and seal joints, penetrations, openings, and projections with manufacturer's recommended tape.
 - 4. Install with corrosion-resistant staples.
- B. Lathing: Apply metal lath taut, with long dimension perpendicular to supports.
 - 1. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.
 - 2. Lap sides of lath minimum 1-1/2 inches.
 - 3. Attach metal lath to framing using nails or screws of type, size, and spacing as recommended by system manufacturer.
 - 4. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
 - 5. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.
- C.2 Mortar: Apply 3/8 inch scratch coat of mortar to lath and allow to dry 48 hours.
- D. Simulated Stone Veneer: Install in accordance with manufacturer's instructions.
 - 1. French Limestone: Do not install stone vertically. Blend the stone on the wall from several different boxes to ensure proper color. Due to the large profile of the French Limestone, Coronado recommends selecting an installer that has previous experience with precast or large tile installations.
 - 2. Apply 3/8 to 1/2 inch of mortar covering to back of each stone.
 - 3. Press units firmly into position, wiggle each piece slightly and apply light pressure to unit to ensure firm bonding, causing mortar to extrude slightly around edges of units and to leave a joint width of Drystacked.
 - 4. Quirk-Miter outside corner joints per details.
- E. Plan work to minimize jobsite cutting. Perform necessary cutting with proper tools to provide uniform edges; take care to prevent breaking unit corners or edges.
- F. Remove excess mortar; do not allow mortar to dry on face of units.
 - 1. Point and tool joints before mortar has set.
 - 2. Clean and finish joints in accordance with architect's and manufacturer's instructions.
- G. Control Joints: Size in accordance with Section 07920 for sealant performance, but in no case larger than adjacent mortar joints in exposed stone units.

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SECTION 047215 - ARCHITECTURAL CAST STONE

- H. Expansion Joints: Provide where indicated on Drawings or as recommended by system manufacturer.
- I. Built-in Work: As work progresses, build in door and window frames, nailing strips, anchor bolts, plates, and other items specified in various sections.
 - 1. Build in items plumb and level.
 - 2. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar.
 - 3. Do not build in organic materials subject to deterioration.

3.3 ADJUSTING

- A. Cutting and Fitting: Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other sections of work to provide correct size, shape, and location.

3.4 CLEANING & PROTECTION

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
 - 1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
 - 2. Repair methods and results subject to Architect's approval.
- B. Clean exposed cast stone after mortar is thoroughly set and cured.
 - 1. Wet surfaces with water before applying cleaner.
 - 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
 - 3. Remove cleaner promptly by rinsing thoroughly with clear water.
- C. Protect from splashing by mortar and other damage.
- D. Remove "primary" efflorescence from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and the NCMA TEK Bulletin #8-3A.
- E. Remove dirt or stains from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and the NCMA TEK Bulletin #8-2A.
- F. Promptly remove excess wet mortar containing integral water repellent mortar admixture from the face of the masonry as work progresses.
- G. Do not use strong acids, overaggressive sandblasting or high-pressure cleaning methods.
- H. Comply with applicable environmental laws and restrictions.
- I. Sealer: Apply sealer to completed surface in accordance with manufacturer's instructions.

END OF SECTION

CHASE
SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structural steel framing and support members.
- B. Base plates and setting plates.
- C. Grouting under base plates.

1.2 RELATED SECTIONS

- A. 055000 – Metal Fabrications: Steel fabrications affecting structural steel work.
- B. 099100 – Paints

1.3 REFERENCES

- A. American Institute of Steel Construction, Inc (AISC)
 - 1. AISC (MAN) - Steel Construction Manual; latest edition.
 - 2. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; latest edition.
 - 3. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts; latest edition.
- B. American Society for Testing and Materials (ASTM)
 - 1. A36/A 36M - Standard Specification for Carbon Structural Steel; latest edition.
 - 2. A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; latest edition.
 - 3. A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; latest edition.
 - 4. A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; latest edition.
 - 5. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; latest edition.
 - 6. A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; latest edition.
 - 7. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; latest edition.
 - 8. A514/A 514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; latest edition.
 - 9. A992/A 992M - Standard Specification for Structural Steel Shapes; latest edition.
 - 10. C1107/C 1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink); latest edition.
- C. American Welding Society (AWS)
 - 1. A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; latest edition.
 - 2. D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; latest edition.
- D. Society for Protective Coatings SSPC-Paint 15 - Steel Joist Shop Primer; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, attachments, and fasteners.
 - 2. Connections.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

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SECTION 051200 - STRUCTURAL STEEL

1.5 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "ASD Manual of Steel Construction" and the AISC "Code of Standard Practice", latest edition.
- B. Fabricator: Company specializing in performing the work of this section with minimum 5 years of experience.
- C. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Angles, Plates, and Channels: ASTM A 36/A 36M.
- B. Steel W Shapes: ASTM A 992/A 992M.
- C. Cold-Formed Structural Tubing: ASTM A 500, Grade B.
- D. Pipe: ASTM A 53/A 53M, Grade B, Finish black.
- E. Structural Bolts and Nuts: Carbon steel, ASTM A 307, Grade A galvanized to ASTM A 153/A 153M, Class C.
- F. High-Strength Structural Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, medium carbon, plain.
- G. Headed Anchor Rods: ASTM A 307, Grade C.
- H. Welding Materials: AWS D1.1; type required for materials being welded.
- I. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107/C 1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- J. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Fabricate connections for bolt, nut, and washer connectors.

2.3 FINISH

- A. Prepare structural component surfaces in accordance with SSPC SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be field welded or in contact with concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2 ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components indicated on shop drawings.

CHASE
SECTION 051200 - STRUCTURAL STEEL

- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
- E. Do not field cut or alter structural members without written approval of Architect of Record and Engineer of Record.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.3 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

CHASE
SECTION 052100 - STEEL JOISTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.

1.2 RELATED SECTIONS

- A. 051200 – Structural Steel: Superstructure framing.
- B. 053100 – Steel Decking: Support framing for openings less than 18 inches in decking.
- C. 055000 – Metal Fabrications: Non-framing steel fabrications attached to joists.
- D. 092200 – Lightgage Metal Support Framing.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2003.
 - 2. A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
 - 3. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2004.
- B. American Welding Society (AWS) D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2006.
- C. Steel Joist Institute (SJI)
 - 1. SJI (SPEC) - Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders; Steel Joist Institute; 2005.
 - 2. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; Steel Joist Institute; 2006.
- D. Steel Structures Painting Council SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

1.5 QUALITY ASSURANCE

- A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.
 - 1. Maintain one copy of each document on site.
- B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.
- C. Erector Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

Transport, handle, store, and protect products to SJI requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Joists:

CHASE
SECTION 052100 - STEEL JOISTS

1. Nucor-Vulcraft Group: www.vulcraft.com (basis of design).
2. Substitutions: See Section 016000.

2.2 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
 1. Provide bottom and top chord extensions as indicated.
 2. End bearing of 2-1/2 inches on steel supports.
 3. Finish: Shop primed.
- B. Accessories: Comply with SJI Specifications.
- C. Anchor Bolts, Nuts and Washers: ASTM A 307, hot-dip galvanized per ASTM A 153/A 153M, Class C.
- D. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars.
- E. Welding Materials: AWS D1.1; type required for materials being welded.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- G. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of size and type required by SJI Specifications for type of joist, chord size and span.

2.3 FINISH

- A. Shop prime joists as specified. Do not prime surfaces that will be field-welded or in contact with concrete.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.
- D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- E. After joist alignment and installation of framing, field weld joist seats to bearing plates.
- F. Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminated at walls or beams.
- G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- H. Do not field cut or alter structural members without approval of joist manufacturer.
- I. After erection, prime welds, abrasions and surfaces not primed, except surfaces to be in contact with concrete.

3.2 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

CHASE
SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Roof deck.
- B. Supplementary framing for openings up to and including 18 inches.

1.2 RELATED SECTIONS

- A. 051200 – Structural Steel: Support framing for openings larger than 18 inches and shear stud connectors.
- B. 052100 – Steel Joists: Support framing for openings larger than 18 inches and shear stud connectors.
- C. 054999 – Cold Formed Metal Framing.
- D. 075400 – Thermoplastic Polyolefin Roofing: Deck Sheathing.
- E. 092200 – Lightgage Metal Support Framing.

1.3 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2006a.
- B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened; 2007
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2006.
- D. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2007.
- E. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- F. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings; 2002 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 013000 for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

1.5 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Deck:
 - 1. United Steel Deck, Inc: www.njb-united.com.
 - 2. Nucor-Vulcraft Group: www.vulcraft.com.
 - 3. Wheeling Corrugating Co: www.wheelingcorrugating.com.
 - 4. Substitutions: refer to Section 016000.

CHASE
SECTION 053100 - STEEL DECKING

2.2 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Minimum Metal Thickness, Excluding Finish: as indicated on plans.
 - 3. Nominal Height: as indicated on plans.
 - 4. Profile: as indicated on plans.
 - 5. Side Joints: Lapped, mechanically fastened.
 - 6. End Joints: Lapped, welded.

2.3 ACCESSORY MATERIALS

- A. Welding Materials: AWS D1.1.
- B. Fasteners: Galvanized hardened steel, self tapping.
- C. Touch-up primer for galvanized surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

2.4 FABRICATED DECK ACCESSORIES

- A. Sheet metal deck accessories: Metal closure strips and cover plates, 22 gage thick sheet steel; of profile and size as indicated; finished same as deck.
- B. Roof sump pans
 - 1. As required or otherwise indicated in the construction documents- coordinate with Plumbing Fixture Schedule and plumbing fixture specifications.
 - 2. 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On steel supports provide minimum 1-1/2 inch bearing.
- C. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods indicated on drawings.
 - 1. Deck attachment shall provide diaphragm capacity as indicated on drawings.
- D. At mechanically fastened male/female side laps fasten at 24 inches on center maximum.
- E. Weld deck in accordance with AWS D1.3.
- F. At deck openings from 6 inches to 18 inches in size, provide 2 x 2 x 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- G. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- H. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- I. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

CHASE
SECTION 054000 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Formed steel stud exterior wall framing.
- B. Formed steel joist framing and bridging.
- C. 'Sill Sealer' sole plate gasket insulation.
- D. Framing connectors and fasteners.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Wood roof sheathing, blocking and miscellaneous framing.
- B. 092200 – Lightgage Metal Support Framing: Lightweight, non-load bearing metal stud framing, and exterior wall sheathing.
- C. 092900 – Gypsum Board.
- D. 095113 – Acoustical Panel Ceilings: Ceiling suspension system.

1.3 REFERENCES

- A. American Iron and Steel Institute (AISI)
 - 1. SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2001 with 2004 supplement. (replaced SG-971)
 - 2. AISI SG-971 - Specification for the Design of Cold-Formed Steel Structural Members; ; 1996, with 2000 supplement.
 - 3. AISI SG-973 - Cold-Formed Steel Design Manual; 1996.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
 - 2. ASTM A653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2006a.
 - 3. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2006.
 - 4. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2004.
- C. American Welding Society (AWS) D1.1/D1.1M - Structural Welding Code - Steel; 2006.
- D. Society for Protective Coatings SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.4 SYSTEM DESCRIPTION

- A. Size components to withstand design loads as follows:
 - 1. Vertical Assembly: 18 psf positive and 18 psf negative. 90 MPH winds exposure C.
 - 2. Horizontal Assembly: 30 psf live loads.
- B. Horizontal Deflection: Design to permit maximum deflection of 1/600 of span.
- C. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
- D. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.5 SUBMITTALS

- A. See Section 013000 for submittal procedures.

CHASE
SECTION 054000 - COLD FORMED METAL FRAMING

- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
- C. Shop Drawings:
 - 1. Shop drawings and calculations bearing the certification of a professional Structural Engineer licensed in the state in which the project is located shall be submitted to the Architect of Record for review and shall contain the following information:
 - a. Erection drawings showing location and spacing for all framing members.
 - b. Size and gauge of all members.
 - c. Detail drawings of all prefabricated assemblies.
 - d. Loading conditions used in design.
 - e. Calculated forces for all members.
 - f. Component details, anchorage details, connection details, splice details and temporary bracing, welds, type and location of fasteners and accessories, or items required of related work.
 - 2. The information provided shall take into account and show all special design, framing, and connection requirements, such as at concentrated loads, unbalanced or unsymmetrical load conditions, and other non-typical framing details.
 - 3. The plans and details indicate the general configuration of framing for typical conditions only. Final configuration of details as well as all supplementary framing to obtain the roof profiles shown on the plans shall be as determined by design.
- D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Calculate structural properties of framing members in accordance with requirements of AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum 5 years of experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated on the drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. Dietrich Metal Framing: www.dietrichindustries.com.
 - 2. MarinoWare: www.marinoware.com.
 - 3. Substitutions: refer to Section 016000.

2.2 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Metal Framing Connectors and Accessories: same manufacturer as framing.

2.3 FRAMING MATERIALS

- A. Studs and Track: ASTM C 955; studs formed to channel, "C," or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Gage and depth: As indicated on the drawings.
 - 2. Galvanized in accordance with ASTM A 653/A 653M G90/Z275 coating.

CHASE

SECTION 054000 - COLD FORMED METAL FRAMING

- B. Joists and Purlins: Fabricated from ASTM A 653/A 653M steel sheet, with G90/Z275 hot dipped galvanized coating.
 - 1. Base Metal: Structural Steel (SS), Grade 50/340, Class 1.
 - 2. Gage and depth: As indicated on the drawings.
- C. Framing Connectors: Factory-made formed steel sheet, ASTM A 653/A 653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
 - 1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members; minimum 16 gage, 0.06 inch thickness.
 - 2. Provide non-movement connections for tie-down to foundation, roof-to-wall tie-down, joist to beam attachment, gusset plates, and stiffeners.

2.4 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- C. 'Sill Sealer' sole plate gasket insulation
 - 1. Material: roll-form closed cell plastic foam.
 - 2. Location: at the top of foundation / slab or as otherwise indicated in the drawings, installed in continuous strips without gaps in coverage.
 - 3. Size: 1/4" thick, matching the width of the sole plate or base track.

2.5 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A 153/A 153M.
- B. Anchorage Devices: Power actuated.
- C. Welding: In conformance with AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C 1007 requirements.
- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- C. Construct corners using minimum of three studs. Install multiple studs at wall openings, door and window jambs as indicated. Provide minimum 2 studs at each side of door and window openings.
- D. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- E. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- F. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- G. Install intermediate studs above and below openings to align with wall stud spacing.
- H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- I. Attach cross studs to studs for attachment of fixtures anchored to walls.
- J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

CHASE
SECTION 054000 - COLD FORMED METAL FRAMING

- K. Touch-up field welds and damaged galvanized surfaces with primer.

3.3 INSTALLATION OF JOISTS

- A. Install framing components in accordance with manufacturer's instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.
- C. Place joists at 24 inches o.c. max.; not more than 2 inches from abutting walls. Connect joists to supports using fastener method.
- D. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.
- E. Provide web stiffeners at reaction points.
- F. Touch-up field welds and damaged galvanized surfaces with primer.

3.4 ERECTION TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION

CHASE
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Permanently mounted ladders.
- B. Handrails, guards, etc.
- C. Loose masonry veneer lintels.
- D. Miscellaneous shop- or field-fabricated metal items indicated in the drawings or other construction documents.

1.2 RELATED SECTIONS

- A. 014000 – Quality Assurance: Requirements for testing and inspections.
- B. 033000 – Cast-In-Place Concrete.
- C. 084113 – Aluminum-Framed Entrances and Storefronts
- D. 099100 – Paints: Field painting of metal fabrications shop primed in this section.
- E. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A36 - Specification for Structural Steel.
 - 2. A53 - Specification for Welded and Seamless Steel Pipe.
 - 3. A123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. A143 - Safeguarding Against Embrittlement of Hot Dipped Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
 - 5. A153 - Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
 - 6. A307 - Specification for Carbon Steel Externally Threaded Standard Fasteners.
 - 7. A366 - Specification for Carbon Steel Cold Rolled Sheet.
 - 8. A384 - Safeguarding Against Warpage and Distortion During Hot Dip Galvanizing of Steel Assemblies.
 - 9. A385 - Providing High Quality Zinc Coatings (Hot Dip).
 - 10. A500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 11. A501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 12. A569 - Specification for Commercial Quality Hot Rolled Sheet and Strip Carbon (0.15 Maximum Percent) Steel.
 - 13. A570 - Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
 - 14. A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

1.4 SUBMITTALS

- A. Make submittals in accordance with Section 013000.
- B. Product Literature: Submit product literature for all prefabricated products.
- C. Shop Drawings: Show details of fabrication and installation; indicate materials, thicknesses, dimensions, methods of reinforcement and embedment, attachments, shop finishes, provisions for work of other trades, and other pertinent information as requested by Architect.
- D. Quality Control Submittal: Submit written certification that items been designed to meet the specified requirements.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Experienced and regularly engaged in producing metal fabrications of the type specified; must employ only skilled personnel using proper equipment to produce work.

CHASE
SECTION 055000 - METAL FABRICATIONS

- B. Regulatory Requirements:
 - 1. Metal fabrications shall be designed to meet the requirements of the jurisdictional code authorities.
 - 2. Furnish all calculations, engineer's stamps, drawings, and other items required by the code authorities to obtain approval.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Carbon Steel:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36.
 - 2. Sheet: ASTM A366.
 - 3. Pipe: ASTM A53, seamless, Type S, plain end; schedule 40 unless indicated otherwise.
- B. Fasteners: Types as indicated, specified, or required for the assembly and installation of fabricated items.
 - 1. Bolts: ASTM A307, unless indicated otherwise; include nuts and plain hardened washers.
 - 2. Drilled-In Concrete Anchors: Ramset "Trubolt Stud Anchor," Hilti Fastening Systems "Kwikbolt," or approved.
- C. Interior Primer: Modified alkyd type (VOC compliant); lead and chromate free; gray or white color; one of the following unless approved otherwise.
 - 1. "Azeron Primer Series 88HS" by Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
 - 2. "Amercoat 5105" by Ameron Protective Coatings (Brea, CA; 714-529-1951).
 - 3. "Carbocoat 150HG" by Carboline Company (St. Louis, MO; 314-644-1000; 800-848-4645).
- D. Exterior Finish Materials:
 - 1. Manufacturer: Tnemec Company Inc. (Kansas City, MO; 816-483-3400).
 - 2. Zinc Primer: "Series 394 PerimePrime"; single component moisture cured primer.
 - 3. Finish: refer to Section 099100 – Paints.
- E. Cold Galvanizing Compound: "Galv-Weld," "Galvican," "ZRC Cold Galvanizing Compound," or equivalent zinc-rich primer.
- F. Miscellaneous Materials: Furnish incidental accessory materials, tools, and equipment as necessary for fabrication and installation of miscellaneous metal items as indicated on the Drawings.
 - 1. Non-Shrink Grout: Master Builder's "Master Flow 713," Sonneborn "SonogROUT," or approved equal.

2.2 PREFABRICATED COMPONENTS

- A. Gate Hinges: refer to Door Hardware Schedule.

2.3 FABRICATION

- A. General Fabrication Requirements: Fabricate as follows, unless specified or indicated otherwise.
 - 1. Verify all dimensions and fabricate to detail with accurate sizes and shapes, straight lines, smooth curves, and sharp angles.
 - 2. Welds shall have sufficient strength to withstand the loads applied.
 - 3. For items exposed to view or subject to contact, grind welds smooth and level with adjacent surfaces; remove all burrs from cut edges. Fill imperfections with body putty as necessary for a smooth even finish.
 - 4. Bend curved sections to a smooth radius free from buckles and twists.
 - 5. Fabrications in exterior locations shall be fabricated to shed water.
 - 6. All welds on fabrications to receive organic zinc primer shall be continuous, full length of joint.
- B. Fabrication of Elements to Receive Galvanized Coatings:
 - 1. Fabricate in accordance with the applicable requirements of ASTM A143, A384, and A385.
 - 2. Remove welding slag and burrs prior to galvanizing.
 - 3. Avoid fabrication techniques which could cause distortion or embrittlement of the steel.

CHASE
SECTION 055000 - METAL FABRICATIONS

2.4 SHOP FINISHES

- A. Hot Dip Galvanizing:
 - 1. Steel fabrications shall be galvanized in accordance with ASTM A123. Bolts, nuts, washers, and other hardware shall be galvanized in accordance with A153.
 - 2. Surface Finish: The galvanized coatings shall be continuous, firmly adhered, smooth, and free from defects.
 - 3. Locations: Provide hot dip galvanizing for all metal fabrications in exterior or moist conditions, unless otherwise indicated. Unless otherwise approved by the Architect, plug and cold galvanize ventilation and lifting holes which will be exposed to moisture penetration in the finished work.
- B. Interior Primed finish:
 - 1. Preparation: Solvent clean in accordance with SSPC-SP1. Remove rust and scale by wire brushing, scraping, and sanding down to bare metal in accordance with SSPC-SP2 and SP3. Where SP2 and SP3 measures are insufficient, provide commercial blast cleaning in accordance with SSPC-SP6. Immediately apply specified prime coat.
 - 2. Apply interior primer in accordance with manufacturer's recommendations.
 - 3. Locations: Provide at all interior metal fabrication exposed to view, unless otherwise indicated. Do not prime surfaces to be embedded in concrete, and surfaces to be field welded.
- C. Interior Special Finish: Prepare and apply prime coat as specified in Section 099100 - Paints.
- D. Exterior Special Finish:
 - 1. Prepare surfaces in accordance with the finish coat manufacturer's recommendations, and as specified below.
 - 2. Galvanized Surfaces: Clean per SSPC SP1.
 - 3. Commercial blast ungalvanized ferrous metal surfaces in accordance with SSPC SP10. Abrade surfaces with 3M "Scotchbrite Heavy Duty" (brown) pad, or as necessary to achieve sufficient profile for paint adhesion.
 - 4. Solvent clean in accordance with SSPC SP-1; commercial blast ungalvanized ferrous metal surfaces in accordance with SSPC SP10. Abrade galvanized surfaces with a metal preparation pad.
 - 5. Apply primers to receive field application of finish coats as specified in Section 099000.
 - 6. Except for surfaces indicated to be field welded, coat all surfaces of fabrication, whether or not exposed to view in installed position.
 - 7. Maintain at least one coat of primer at all times during installation. Immediately patch damaged coatings.
 - 8. Finish coat shall be free of dirt, flow lines, sags, blisters, pinholes, and other surface imperfections.
 - 9. Locations: Provide at all exterior metal fabrication exposed to view, and other fabrications as scheduled. Do not prime surfaces to be field welded.

2.5 PROTECTION

- A. For metal in contact with concrete, masonry, and other dissimilar materials, coat contact surfaces with zinc-rich primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION

- A. Precisely install metal fabrications in locations shown. Unless indicated otherwise, fabrications shall be installed plumb and level.

CHASE

SECTION 055000 - METAL FABRICATIONS

- B. Provide all anchorage devices as indicated and required for a secure installation.
- C. Touch-up all surfaces damaged during installation. Patch all welds and damage marks with matching primer(s).
- D. Coordinate with Section 033000 for concrete fill at pipe bollards.
- E. Erection Tolerances (as Applicable)
 - 1. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
 - 2. Maximum Offset From True Alignment: 1/4 inch.
 - 3. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

CHASE
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structural and non-structural dimension lumber framing.
- B. Rough opening framing for doors, windows, and roof openings.
- C. Roof decking and sheathing and wall sheathing.
- D. Structural-use wood panels.
- E. Preservative treated wood materials.
- F. Fire retardant treated wood materials.
- G. Miscellaneous framing and sheathing, including nailers, cants, blocking, supports, furring and grounds.
- H. Communications and electrical room mounting boards.
- I. Air infiltration barrier (building wrap).
- J. 'Sill Sealer' sole plate gasket insulation.
- K. Metal framing connectors and fasteners.
- L. Construction adhesives.

1.2 RELATED SECTIONS

- A. 055000 – Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

1.3 REFERENCES

- A. AFPA T10 - Wood Frame Construction Manual; American Forest and Paper Association; latest edition.
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A153/A153M: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; latest edition.
 - 2. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials; latest edition.
- C. American Wood Preservers Association (AWPA)
 - 1. AWPA C2: Lumber, Timber, Bridge Ties and Mine Ties Preservative Treatment by Pressure Processes; latest edition.
 - 2. AWPA C9: Plywood Preservative Treatment by Pressure Processes; latest edition.
 - 3. AWPA C20: Structural Lumber Fire Retardant Treatment by Pressure Processes; latest edition.
 - 4. AWPA C27: Plywood Fire Retardant Treatment by Pressure Processes; latest edition.
- D. Forest Stewardship Council (FSC).
- E. U.S. Department of Commerce National Institute of Standards and Technology (NIST)
 - 1. NIST PS 1: Structural Plywood; latest edition.
 - 2. NIST PS 20: American Softwood Lumber Standard; latest edition.
- F. SPIB GR: Grading Rules; Southern Pine Inspection Bureau (SPIB), Inc.; latest edition.
- G. WWPA G-5: Western Lumber Grading Rules; Western Wood Products Association; latest edition.
- H. APA E30: Engineered Wood Construction Guide0 American Plywood Association (APA); latest edition.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product data for each type of process and factory-fabricated product indicated

CHASE
SECTION 061000 - ROUGH CARPENTRY

1. Include data for wood-preservative and fire-retardant treatments from chemical treatment manufacturers and certification by treating plant that materials comply with requirements.
- C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses.
- D. Research / evaluation reports
 1. Treated wood.
 2. Power-driven and powder-actuated fasteners and expansion anchors.
 3. Metal framing anchors.
 4. Air Infiltration Barrier / Building Wrap and associated fasteners, sealants and tapes.
 5. Construction adhesives.
 6. 'Sill Sealer' gasket insulation.

1.5 QUALITY ASSURANCE

- A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
- B. Each piece of lumber delivered from the vendor shall bear grade mark, stamp or other identifying mark indicating grade of material and grading agency rules under which the material was produced.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Stack lumber in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.
- D. Locate stacks on well drained areas, supported at least 150 mm (6 inches) above grade and cover with well ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Lumber fabricated from old growth timber is not permitted.

2.2 DIMENSION LUMBER

- A. Comply with PS 20 and requirements of specified grading agencies for dimension lumber.
- B. Species
 1. Douglas Fir-Larch and Hem-Fir: Western Wood Products Association (WWPA).
 2. Southern Pine: Southern Pine Inspection Bureau (SPIB).
 3. Spruce-Pine-Fir: Northeastern Lumber Manufacturers Association (NLMA).
- C. Sizes: Nominal sizes as indicated on drawings, S4S.
- D. Moisture Content: S-dry or MC19 (19% maximum).
- E. Minimum grades
 1. Stud framing (2 x 2 through 2 x 6): No. 2 and better.
 2. Joist, rafter, and small beam framing (2 x 6 through 4 x 16): No. 2 and better.
 3. Miscellaneous load-bearing framing, blocking, nailers, grounds, and furring: No. 2 and better.
 4. Miscellaneous non-load-bearing framing, blocking, nailers, grounds, and furring: No. 3 / Utility / Standard and better.

2.3 STRUCTURAL-USE WOOD PANELS

- A. Where structural-use panels are indicated, provide APA-performance-rated panels complying with the requirements designated under each application for grade, span rating, exposure durability classification and edge detail.
- B. Roof decking: Plywood, PS 1, Grade C-D, Exposure 1, Structural I, span rating 40/20, thickness as indicated.
- C. Wall and roof sheathing: Plywood, PS 1, Grade C-D, Exposure I, thickness as indicated.

CHASE
SECTION 061000 - ROUGH CARPENTRY

- D. Communications and Electrical Room Mounting Boards: Interior grade, A-D plywood; 3/4 inch thick; fire retardant treated, flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E 84.
- E. All construction panels shall be Formaldehyde Free.

2.4 ACCESSORIES

- A. Metal framing connectors, fasteners and anchors
 - 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M or of Type 304 stainless steel where rough carpentry is exposed to weather or for high humidity and/or preservative-treated wood locations, standard galvanized steel elsewhere. Unfinished steel is not acceptable.
 - 2. Nails, wire, brads and staples: FS FF-N-105.
 - 3. Power-driven fasteners: CABO NER-272.
 - 4. Wood screws: ASME B18.6.1.
 - 5. Lag bolts: ASME B18.2.1.
 - 6. Bolts: steel bolts complying with ASTM A307, Grade A, with ASTM A563 hex nuts and, where indicated, flat washers.
 - 7. Refer to Section 055000 – Metal Fabrications.
- B. Sill sealer gasket on top of foundation wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- C. Air infiltration barrier: Refer to Section 072600 – Weather Barriers, Air Barrier Sheet.
- D. Construction adhesives: As recommended by the lumber manufacturer and grading agency use guide for the intended use, meeting the ASTM testing requirements for the use and exposure.

2.5 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPAC2 (lumber) and AWPAC9 (plywood). Mark each treated item with the quality mark requirements of an inspection agency approved by the ALSC Board of Review.
 - 1. Do not use chemicals containing Chromium or Arsenic, except where specifically noted as “CCA Planks”, which shall be treated with Chromated Copper Arsenate, in accordance with the standards listed above.
 - 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Above-ground preservative-treated-wood materials shall be treated with waterborne preservatives to a minimum retention of 0.25 lb./cu.ft. and kiln-dried to a maximum moisture content of 19% for lumber and 15% for plywood. Treat all materials as indicated in the construction documents and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and water proofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - 3. Wood floor plates installed over concrete slabs in direct contact with earth.
- C. Pressure-treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 lb./cu.ft.
- D. Complete fabrication of treated items before treatment, where possible. Of cut after treatment, apply field treatment complying with AWPAC4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.6 FIRE-RETARDANT-TREATED MATERIALS

- A. Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPAC20 (lumber) and AWPAC27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of U.L.; U.S. Testing; Timber Products Inspection, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

CHASE
SECTION 061000 - ROUGH CARPENTRY

1. Research or Evaluation reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Interior Type: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. Bending strength, stiffness and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Exterior Type: Use for exterior locations and where indicated.
- D. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- B. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.
- B. Make provisions for temporary construction loads and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.
- G. Discard material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Coordinate location of furring, nailers, blocking, grounds and similar supports to allow for attachment of other construction.

CHASE
SECTION 061000 - ROUGH CARPENTRY

- I. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the most restrictive requirements of the following:
 - 1. Published requirements of metal framing anchor manufacturer.
 - 2. International Building Code Chapter 23 fastening schedules for dimension lumber and structural-use panels.
 - 3. Factory Mutual standards specified in Section 076200 – Flashing and Sheet Metal Trim.
- K. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of a 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; predrill as required.

3.4 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Attach to substrates to support applied loading and meet applicable referenced standards. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation for masonry work. Where possible, anchor to formwork before concrete placement.
- F. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1 1/2" wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.
- G. Specifically, provide the following non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Grab bars.
 - 3. Towel and bath accessories.
 - 4. Wall-mounted door stops.
 - 5. Gypsum board interior finish system edges and corners.

3.5 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.6 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

- A. Coordinate installation of wood decking and prefabricated wood trusses.

3.7 INSTALLATION OF STRUCTURAL-USE PANELS

- A. Roof decking: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. At panel edges between roof framing members, use sheathing "H" clips between sheets, minimum 1 per span.
 - 2. Screw panels to metal framing and nail panels to wood framing; staples are not permitted.
- B. Wall and roof sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
 - 1. Place air infiltration barrier horizontally over wall sheathing, weather lapping edges and ends.

CHASE
SECTION 061000 - ROUGH CARPENTRY

- C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.8 CLEANING

- A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

CHASE
SECTION 061643 – EXTERIOR GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass-mat faced, moisture- and mold-resistant gypsum sheathing.

1.2 RELATED SECTIONS

- A. 053100 – Steel Decking.
- B. 054000 – Cold Formed Metal Framing.
- C. 061000 - Rough Carpentry.
- D. 072113 – Board Insulation.
- E. 072400 – Exterior Insulation and Finish System.
- F. 072423 – Direct-Applied Finish Systems
- G. 072500 – Weather Barriers.
- H. 092200 – Lightgauge Metal Support Framing.
- I. 092423 – Portland Cement Stucco.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM C473: Standard Test Methods for Physical Testing of Gypsum Panel Products; latest edition.
 - 2. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; latest edition.
 - 3. ASTM C920: Standard Specification for Elastomeric Joint Sealants; latest edition.
 - 4. ASTM C1002: Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; latest edition.
 - 5. ASTM C1177: Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; latest edition.
 - 6. ASTM C1184: Standard Specification for Structural Silicone Sealants; latest edition.
 - 7. ASTM C1280: Standard Specification for Application of Gypsum Sheathing; latest edition.
 - 8. ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; latest edition.
 - 9. ASTM D6329: Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers; latest edition.
 - 10. ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; latest edition.
 - 11. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials; latest edition.
- B. GA-253 Application of Gypsum Sheathing; Gypsum Association (GA); latest edition.

1.4 SUBMITTALS

- A. Make submittals in accordance with Section 013300.
- B. Product Data: Manufacturer's specifications and installation instructions for each product specified.

1.5 WARRANTY

- A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).
- B. Manufacturer's Warranty:
 - 1. Five years against manufacturing defects.
 - 2. Ten years against manufacturing defects when used as a substrate in architecturally specified EIFS.

CHASE
SECTION 061643 – EXTERIOR GYPSUM SHEATHING

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fiberglass-mat faced gypsum sheathing
 - 1. Manufactured in accordance with ASTM C1177.
 - 2. Thickness: 1/2" or 5/8" as noted in drawings.
 - 3. Provided in largest available panels to minimize joints.
 - 4. Edges: square.
 - 5. Surfacing: fiberglass mat on face, back, and long edges.
 - 6. Mold resistance 10 per ASTM D3273.
 - 7. Microbial resistance: Will not support microbial growth per ASTM D6329, GREENGUARD 3-week protocol).
 - 8. Manufacturers, products
 - a. Georgia-Pacific; www.gp.com; DensGlass.
 - b. United States Gypsum Corp.; www.usg.com; Securock.
 - c. CertainTeed Corporation; www.certainteed.com; GlasRoc.
 - d. National Gypsum Company; www.nationalgypsum.com; Gold Bond eXP.
 - e. Substitutions: refer to section 016000.
- B. Fire-Resistance-Rated Fiberglass-Mat Faced Gypsum Sheathing, Type X
 - 1. Manufactured in accordance with ASTM C1177, Type X.
 - 2. Thickness: 5/8.
 - 3. Provided in largest available panels to minimize joints.
 - 4. Edges: square.
 - 5. Surfacing: fiberglass mat on face, back, and long edges.
 - 6. Mold resistance 10 per ASTM D3273.
 - 7. Microbial resistance: Will not support microbial growth per ASTM D6329, GREENGUARD 3-week protocol).
 - 8. Manufacturers, products
 - a. Georgia-Pacific, www.gp.com, DensGlass.
 - b. United States Gypsum Corp., www.usg.com, Securock.
 - c. CertainTeed Corporation, www.certainteed.com, GlasRoc.
 - d. National Gypsum Company; www.nationalgypsum.com; Gold Bond eXP.
 - e. Substitutions: refer to section 016000.
- C. Screws: ASTM C1002, corrosion resistant treated.
- D. Joint and penetration sealant: cured single- or multi-component cold-applied elastomeric structural silicone joint sealant compliant with ASTM C920 and ASTM C1184.
 - 1. Classifications: Type S, Grade NS, Class 50, Use NT, G, A and O.
 - 2. Manufacturers, products
 - a. Dow Corning Corporation; www.dowcorning.com; #795.
 - b. Pecora Corporation; www.pecora.com; #890 and #890-TBS.
 - c. GE / Momentiv Performance Materials; www.siliconeforbuilding.com; SilPruf SCS2000.
 - d. Substitutions: refer to section 016000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- B. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.
- C. Verify that framing is ready for installation of sheathing.

CHASE

SECTION 061643 – EXTERIOR GYPSUM SHEATHING

3.2 GYPSUM SHEATHING INSTALLATION

- A. Install boards parallel or perpendicular to framing. Install boards parallel to framing at fire rated walls. Apply sheathing with joints staggered. All edges shall be firmly supported.
- B. Install sheathing boards parallel or perpendicular to framing. Install parallel to framing at fire rated walls. Apply sheathing with vertical joints staggered. All edges shall be supported as follows:
 - 1. Maximum span: 24 inches.
 - 2. Maximum cantilever: 2 inches.
- C. Install sheathing with coating towards exterior.
- D. Screw to framing. Space fasteners 8 inches o.c. in field and 4 inches o.c. at ends along each framing member.
- E. Do not bridge expansion or seismic joints.
- F. Coordinate with Division 26 work for cutouts for electrical penetrations.
- G. Install gypsum sheathing to exterior soffits indicated for portland cement plaster.
- H. If sheathing is not to be covered by finish material within 6 months after purchase, cover the material as necessary to maintain the manufacturer's warranty.
- I. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.

3.3 PROTECTION

- A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

END OF SECTION

CHASE
SECTION 062000 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Custom wood millwork.
- B. Wood door and glazing frame assemblies.
- C. Interior standing and running wood and laminate trim.
- D. Interior wood and laminate panel assemblies.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry.
- B. 064116 – Plastic Laminate-Clad Architectural Cabinets.
- C. 088000 – Glazing.
- D. 099100 – Paints.
- E. 099300 – Stains and Transparent Finishes.

1.3 REFERENCES

- A. Architectural Woodwork Standards; Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute (AWI/AWMAC/WI); latest edition.
- B. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; latest edition.
- C. U.S Department of Commerce National Institute of Standards and Technology (NIST)
 - 1. PS 1 - Structural Plywood; latest edition.
 - 2. PS 20 - American Softwood Lumber Standard; latest edition.
- D. NHLA Grading Rules for North American Hardwoods; National Hardwood Lumber Association; latest edition.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit shop drawings in conformance with the requirements of the *Architectural Woodwork Standards*.
 - 2. Submit two copies, one of which will be returned with reviewed notations. Make corrections noted (if any) and distribute required copies prior to the start of work.
- B. Samples:
 - 1. Submit four samples of each species and profile of wood to be used. Lumber samples to be minimum 6" length; plywood samples to be minimum 12" by 12". Samples shall represent the range of color and grain expected to be provided.
 - 2. Submit four additional samples of each material for the use of the paint trade.

1.5 QUALITY ASSURANCE

- A. Work shall be in accordance with the Grade or the Grades Specified of Architectural Woodwork Standards.
- B. Qualification:
 - 1. Firm (woodwork manufacturer) with no less than 5 years of production experience similar to this Project, whose qualifications indicate the ability to comply with the requirements of this Section.
 - 2. The woodwork manufacturer must have had at least one project in the past 5 years where the scope of the woodwork was similar to this project.
- C. Single Source Responsibility: A single manufacturer shall provide and install the work of this Section.

CHASE
SECTION 062000 - FINISH CARPENTRY

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials only when the project is ready for installation and the general contractor has provided a clean storage area.
 - 1. Delivery of architectural millwork shall be made only when the area of operation is enclosed, all plaster and concrete work is dry and the area broom clean.
 - 2. Maintain indoor temperature and humidity within the range recommended by the Architectural Woodwork Standards for the location of the project.
 - 3. Protect work from moisture damage.

1.7 SCHEDULING

- A. Coordinate fabrication, delivery, and installation with the general contractor and other applicable trades.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. Unless otherwise indicated provide products of quality specified by AWI Architectural Woodwork Standards for Custom grade.
- B. Wood fabricated from old growth timber is not permitted.

2.2 LUMBER MATERIALS

- A. Lumber shall be sound, kiln dried, and in accordance with the *Architectural Woodwork Standards* requirements for its use and the Grade specified.
- B. Softwood lumber: not permitted.
- C. Hardwood lumber for paint finish: Poplar species, maximum moisture content 9%, NHLA Grade No. 1 Common or better.
- D. Hardwood lumber for stain and clear finish: Species as indicated on drawings, NHLA Grade FAS/1F.
- E. Particleboard and similar low-density manufactured wood products are not acceptable.

2.3 SHEET MATERIALS

- A. All plywood shall be fabricated with adhesives free from added urea-formaldehyde.
- B. Softwood plywood: not permitted.
- C. Hardwood plywood: PS 1 Grade A-B; veneer core; species as indicated in drawings, rotary cut.
- D. Veneer plywood for paint finish: MDF, MDO or PS1 Grade A-B; veneer core; rotary cut; Poplar, Alder or Birch species.
- E. Veneered components shall be in accordance with the *Architectural Woodwork Standards* requirements for the Grade specified.

2.4 ADHESIVE

- A. Component adhesive: Type II.

2.5 FASTENERS

- A. Fasteners: Of size and type to suit application; Galvanized finish in concealed locations and bright finish in exposed locations.

2.6 ACCESSORIES

- A. Glass: As indicated in the drawings and as specified in Section 088000.

2.7 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.

CHASE
SECTION 062000 - FINISH CARPENTRY

- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- C. Interior Millwork shall be *Architectural Woodwork Standards* Custom Grade
- D. Door and glazing frame assemblies shall be solid wood flat jamb with applied stop.
- E. Exposed edges of sheet materials shall be edge banded with closed grain hardwood veneer matching the species of the panel veneer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify that mechanical, electrical, plumbing, and other building components effecting work in this Section are in place and ready.

3.2 INSTALLATION

- A. Install all work in conformance with the Architectural Woodwork Standards, latest edition.
 - 1. Installation shall conform to the AWS Grade of the items being installed.
- B. All work shall be secured in place, square, plumb, and level.
- C. All work abutting other building components shall be properly scribed.
- D. Mechanical fasteners used at exposed and semi-exposed surfaces shall be countersunk.

3.3 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Sand work smooth.
- B. All nicks, chips and scratches shall be sanded out or filled and re-touched. Damaged items which cannot be repaired shall be replaced
- C. Refer to Sections 099100 – Paints and 099300 – Stains and Transparent Finishes.

3.4 INSTALLATION TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.5 CLEANUP

- A. Upon completion of installation, the installer shall clean all installed items of pencil and ink marks, and broom clean the area of operation, depositing debris in containers provided by the general contractor.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wood-veneer-faced architectural cabinets.
- B. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets that are not concealed within other construction.
- C. Shop finishing of architectural cabinets.
- D. Cabinet hardware.

1.2 RELATED SECTIONS

- A. 055000 – Metal Fabrications
- B. 061000 – Rough Carpentry
- C. 064116 – Plastic-Laminate-Clad Architectural Cabinets
- D. 092800 – Gypsum Board
- E. 079200 – Joint Sealants

1.3 REFERENCES

- A. ANSI A135.4 - American National Standard for Basic Hardboard; latest edition.
- B. ANSI A208.1 - American National Standard for Particleboard; latest edition.
- C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; latest edition.
- D. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute (AWI/AWMAC/WI) - Architectural Woodwork Standards; latest edition.
- E. American National Standards Institute / Builders Hardware Manufacturers Association (ANSI/BHMA)
 - 1. ANSI/BHMA A156.9 - Cabinet Hardware; latest edition.
 - 2. ANSI/BHMA A156.11 - Cabinet Locks; latest edition.
- F. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber; Federal Specifications and Standards; latest edition.
- G. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; latest edition.
- H. WI (MAN) - Manual of Millwork; Woodwork Institute; latest edition.
- I. SPIB (GR) – Grading Rules; Southern Pine Inspection Bureau; latest edition.
- J. Western Lumber Grading Rules; Western Wood Products Association; latest edition.
- K. Eastern White Pine Grading Rules; Northeastern Lumber Manufacturers Association; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Shop Drawings
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing and electrical fixtures and devices, and other items installed in plastic-laminate-clad architectural cabinets.
 - 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 - 5. Apply AWI Quality Certification Program label to shop drawings.

SECTION 064113 – WOOD-VENEER-FACED ARCHITECTURAL CABINETS

- C. Product Data: For each type of product, including panel products, finishes, and cabinet hardware and accessories.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification from treatment plant that treated materials comply with requirements.
- D. Samples:
 - 1. For each exposed product and for each color and finish specified, including edge banding, 12"x12" min.; 2 of each type.
 - 2. Pulls, hinges, drawer slides, shelf pins; 2 of each type.
 - 3. Other exposed hardware; 2 of each type.

1.5 QUALITY ASSURANCE

- A. Perform all work and manufacture all products in accordance with AWI/AWMAC Architectural Woodwork Standards, Premium Grade, unless other quality is indicated for specific items.
- B. Cabinet manufacturer qualifications.
 - 1. Company specializing in manufacturing the products specified in this section with minimum 5 years of experience.
 - 2. Licensed participant in AWI Quality Certification Program or WI Certified Compliance Program.
 - 3. Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- C. Cabinet installer qualifications.
 - 1. Manufacturer of products.
- D. Hardware manufacturer qualifications.
 - 1. A manufacturer capable of fabricating hardware that meets or exceeds performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.
- B. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions match those required by this Article.
- C. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 86 deg. F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.7 VERIFICATION OF FIELD CONDITIONS

- A. Field Measurements
 - 1. Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings.
 - 2. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 - 3. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on shop drawings.
- B. Established Dimensions
 - 1. Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit.
 - 2. Provide allowance for trimming at site.
 - 3. Coordinate construction to ensure that actual dimensions correspond to established dimensions.
 - 4. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related work specified in other sections to ensure that cabinets can be supported and installed as indicated.

1.8 WARRANTY

- A. Cabinets and shop finishes: Cabinets will be free in defects from material and workmanship under normal use to the original consumer for a period of five years from the date of Substantial Completion.

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If the cabinetry fails during the predetermined warranty period due to normal use, the manufacturer will repair the defect or provide replacement parts, including labor.

- B. Hardware: Manufacturer agrees to replace hardware components that fail in materials or workmanship within one year from date of Substantial Completion.
- C. Exclusions.
 - 1. Abuse and normal wear and tear.
 - 2. Colorfastness of clear finishes.
 - 3. Variations in finish characteristics due to the use of natural wood.

PART 2 - PRODUCT

2.1 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Exposed surfaces.
 - 1. Architectural woodwork standards grade: Premium.
 - 2. Type of construction: Frameless.
 - 3. Door and drawer-front style: Flush overlay.
 - 4. Wood for exposed surfaces: American red oak, select and better, quarter-sliced and plank-matched.
 - 5. Grain direction: Vertical for doors and fixed panels; Horizontal for drawer fronts; as indicated otherwise on drawings.
- B. Semi-exposed surfaces.
 - 1. Architectural woodwork standards grade: Custom.
 - 2. Surfaces other than drawer bodies: plastic laminate as indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.
 - 3. Drawer sub-fronts, backs, sides, and bottoms: plastic laminate as indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.
 - 4. Toe kick boards: plastic laminate as indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.

2.2 WOOD CABINETS FOR OPAQUE FINISH

- A. Exposed surfaces.
 - 1. Architectural woodwork standards grade: Custom.
 - 2. Type of construction: Frameless.
 - 3. Door and drawer-front style: Flush overlay.
 - 4. Wood for exposed lumber surfaces: Any closed-grain hardwood.
 - 5. Panel product for exposed surfaces: Medium-density fiberboard.
- B. Semi-exposed surfaces.
 - 1. Architectural woodwork standards grade: Custom.
 - 2. Surfaces other than drawer bodies: plastic laminate as indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.
 - 3. Drawer sub-fronts, backs, sides, and bottoms: plastic laminate as indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.
 - 4. Toe kick boards: plastic laminate as indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.

2.3 WOOD MATERIALS

- 1. Wood products.
 - a. Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - b. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 - c. Wood moisture content: 8 to 13 percent.
- 2. Composite wood and agrifiber products.
 - a. Products shall be made without urea formaldehyde.
 - b. MDF: ANSI A208.2, Grade 130.
 - c. Particleboard: ANSI A208.1, Grade M-2.

SECTION 064113 – WOOD-VENEER-FACED ARCHITECTURAL CABINETS

3. Softwood plywood: DOC PS 1
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1
5. Thermoset decorative panels: As indicated in Section 064116 – Plastic-Laminate-Clad Architectural Cabinets.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. Cabinet Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 1/2 inch centers; zinc, chrome or nickel; satin finish. Use for all shelves inside cabinets.
 1. Quality standard: BHMA A156.9, Grade 1.
 2. Manufacturer, product: Knappe & Vogt, KV255ZC.
 3. Substitutions: refer to Section 016000.
- B. Drawer and door pulls: As indicated in drawings.
- C. Cabinet Locks
 1. Keyed cylinder, two keys per lock, steel with chrome finish. Keyed alike as noted on drawings.
 2. Quality standard: BHMA A156.11, Grade 1.
 3. Manufacturer, product: Timberline, Interchangeable Lock Plug System.
 4. Substitutions: none permitted.
- D. Drawer Slides: Side-mounted, commercial grade, 100 lb. capacity, full extension, ball bearing.
 1. Quality standard: BHMA A156.9, Grade 1HD-100.
 2. Sized for drawer loading with paper (30 lb / cu. ft.).
 3. Manufacturers
 - a. Dynaslide
 - b. Accuride
 - c. Substitutions: refer to Section 016000.
- E. Hinges: Concealed (fully mortised) type, self closing, steel with satin chrome finish.

2.5 MISCELLANEOUS COMPONENTS

- A. Furring, Blocking, Shims, and Hanging Strips: [Softwood or hardwood lumber] [Fire-retardant-treated softwood lumber], kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
 1. Laminate adhesive: Contact adhesive as recommended by laminate manufacturer and compatible with the specified substrate and service conditions.
 2. Wood adhesive: as recommended by AWI for the materials being joined and service conditions.
- D. Fasteners: as recommended by AWI or, if recommendation not provided, size and type to suit application.
 1. Galvanized or chrome-plated steel in concealed locations.
 2. Stainless steel or chrome-plated steel in exposed locations.
 3. Furring, blocking, shims and hanging strips: softwood or hardwood lumber, kiln dried.
 4. Anchors: select material, type, size and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use non-ferrous metal or hot dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- E. Concealed Joint Fasteners: Threaded steel.
- F. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

2.6 CABINET FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease edges and corners to 1/16-inch radius unless otherwise indicated.
- B. Assemble drawer systems in accordance with manufacturer's written instructions.

- C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.7 SHOP FINISHING

- A. General: Finish architectural cabinets at manufacturer's shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural cabinets, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent finish:
 - 1. Architectural woodwork standards grade: Same as item to be finished.
 - 2. Finish system: Conversion varnish.
 - 3. Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: As indicated in drawings.
 - 5. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D523.
- D. Opaque Finish:
 - 1. Architectural woodwork standards grade: Premium.
 - 2. Finish system: Catalyzed acrylic lacquer.
 - 3. Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Color: As indicated in the drawings.
 - 5. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas for not less than 72 hours.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.
- C. Verify adequacy of backing and support framing.
- D. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
- G. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

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SECTION 064113 – WOOD-VENEER-FACED ARCHITECTURAL CABINETS

- H. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips, or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Adjust moving or operating parts to function smoothly and correctly.
- C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. High Pressure Decorative Laminate (HPDL) ('plastic laminate') and Thermofused Melamine Laminate (TFM) ('melamine') fabrications:
 - 1. Plastic laminate cabinet units and components
 - 2. Plastic laminate post formed countertops, splashes, aprons, etc.
 - 3. Plastic laminate shelving.
 - 4. Suspended wood ceiling panels and associated hardware and mounting system.
- B. Cabinet hardware.
- C. Wood furring, blocking, shims and hanging strips for installing plastic-laminate-clad architectural cabinets unless concealed within other construction before cabinet installation.

1.2 RELATED SECTIONS

- A. 055000 – Metal Fabrications
- B. 061000 – Rough Carpentry
- C. 066116 – Solid Surface Fabrications

1.3 REFERENCES

- A. ANSI A135.4 - American National Standard for Basic Hardboard; latest edition.
- B. ANSI A208.1 - American National Standard for Particleboard; latest edition.
- C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; latest edition.
- D. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute (AWI/AWMAC/WI) - Architectural Woodwork Standards; latest edition.
- E. American National Standards Institute / Builders Hardware Manufacturers Association (ANSI/BHMA)
 - 1. ANSI/BHMA A156.9 - Cabinet Hardware; latest edition.
 - 2. ANSI/BHMA A156.11 - Cabinet Locks; latest edition.
- F. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber; Federal Specifications and Standards; latest edition.
- G. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; latest edition.
- H. WI (MAN) - Manual of Millwork; Woodwork Institute; latest edition.
- I. SPIB (GR) – Grading Rules; Southern Pine Inspection Bureau; latest edition.
- J. Western Lumber Grading Rules; Western Wood Products Association; latest edition.
- K. Eastern White Pine Grading Rules; Northeastern Lumber Manufacturers Association; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Shop Drawings
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing and electrical fixtures and devices, and other items installed in plastic-laminate-clad architectural cabinets.
- C. Product Data: For each type of product, including panel products, high pressure decorative laminate, adhesive for bonding plastic laminate, and cabinet hardware and accessories.

SECTION 064116 – PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification from treatment plant that treated materials comply with requirements.

D. Samples:

1. Laminated panels, including laminated edges, 12"x12" min.; 2 of each type.
2. Pulls, hinges, drawer slides, shelf pins; 2 of each type.
3. Other exposed hardware; 2 of each type.

1.5 QUALITY ASSURANCE

- A. Perform all work and manufacture all products in accordance with AWI/AWMAC Architectural Woodwork Standards, Custom quality, unless other quality is indicated for specific items.
- B. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions match those required by this Article.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.
- B. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions match those required by this Article.
- C. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 86 deg. F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.7 VERIFICATION OF FIELD CONDITIONS

- A. Field Measurements
 1. Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings.
 2. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 3. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on shop drawings.
- B. Established Dimensions
 1. Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit.
 2. Provide allowance for trimming at site.
 3. Coordinate construction to ensure that actual dimensions correspond to established dimensions.
 4. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related work specified in other sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Standards, composed of wood chips bonded with moisture resistant adhesive under heat and pressure; sanded faces; thickness as required; use for components indicated on Drawings.
- B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Standards; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.

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- C. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.
- D. All panel material must be Formaldehyde Free.
- E. Wood fabricated from old growth timber is not permitted.

2.2 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL) ('Plastic Laminate'): NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Cabinet exterior faces and other surfaces exposed to view.
 - a. Faces and edges: manufacturers, products, patterns and colors as indicated in the drawings.
 - b. Edges shall be HPDL laminate- PVC edge banding not permitted.
 - 2. Semi-exposed surfaces (cabinet interiors, concealed shelves, etc.).
 - a. Faces and drawer edges: manufacturers and products as indicated in the drawings.
 - b. Adjustable shelf edges: .012" (3mm) min. thickness PVC edge banding color-matched to laminate faces.
 - c. Color: white.
 - 3. Countertops, splashes and aprons.
 - a. Faces and edges: manufacturers, products, patterns and colors as indicated in the drawings.
 - b. Edges shall be HPDL laminate matching the face material. PVC edge banding not permitted.
 - 4. Toe kick board (where not indicated as vinyl base)
 - a. Faces and edges: manufacturers, products, patterns and colors as indicated in the drawings.
 - b. Edges shall be HPDL laminate matching the face material. PVC edge banding not permitted.
- B. Plastic Laminate shelf Edge Banding: 3mm PVC color-matched to surface laminate.
- C. Thermofused Melamine (TFM) Laminate ('Melamine'): NEMA LD 3, horizontal grade (HGS), color white.
 - 1. Drawer boxes (sub-front, back, sides and bottom).
 - 2. Edge banding: 0.018" white PVC.

2.3 WOOD MATERIALS

- A. Dimension softwood frame components in sizes indicated on drawings or as required, in grades specified.
 - 1. Douglas Fir, Hem-fir, SPF or similar species: WWSA grade #1 Common or better.
 - 2. Southern Pine: SPIB grade Finish D and better.
 - 3. Eastern White Pine: NLMA grade Premium and better.
- B. Moisture content: 5%-10%.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. Cabinet Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 1/2 inch centers; zinc, chrome or nickel; satin finish. Use for all shelves inside cabinets.
 - 1. Quality standard: BHMA A156.9, Grade 1.
 - 2. Manufacturer, product: Knappe & Vogt, KV255ZC.
 - 3. Substitutions: refer to Section 016000.
- B. Drawer and Door Pulls: "U" shaped wire pull; zinc, chrome or nickel; satin finish; 4 inch centers; solid metal; back-mounted; 5/16" diameter.
- C. Cabinet Locks: Keyed cylinder, two keys per lock, steel with chrome finish. Keyed alike as noted on drawings.
 - 1. Quality standard: BHMA A156.11, Grade 1.
 - 2. Manufacturer, product: Timberline, Interchangeable Lock Plug System.

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- 3. Substitutions: none permitted.
- D. Drawer Slides: Side-mounted, commercial grade, 100 lb. capacity, full extension, ball bearing.
 - 1. Quality standard: BHMA A156.9, Grade 1HD-100.
 - 2. Sized for drawer loading with paper (30 lb / cu. ft.).
 - 3. Manufacturers
 - a. Dynaslide
 - b. Accuride
 - c. Substitutions: refer to Section 016000.
- E. Hinges: Concealed (fully mortised) type, self closing, steel with satin chrome finish.
- F. Grommets
 - 1. Locations as noted in drawings.
 - 2. Linear brush
 - a. Doug Mocket & Co., #BRKIT Brush Extrusion Kit, 12" length unless otherwise noted.
 - b. Substitutions: refer to Section 016000.
 - 3. Round plastic
 - a. Doug Mocket & Co., #BG, 1 1/2" diameter, black, with flip-top cap.
 - b. Substitutions: refer to Section 016000.

2.5 CLEATS, BLOCKING AND MISCELLANEOUS COMPONENTS

- A. Laminate adhesive: Contact adhesive as recommended by laminate manufacturer and compatible with the specified substrate and service conditions.
- B. Wood adhesive: as recommended by AWI for the materials being joined and service conditions.
- C. Fasteners: as recommended by AWI or, if recommendation not provided, size and type to suit application.
 - 1. Galvanized or chrome-plated steel in concealed locations.
 - 2. Stainless steel or chrome-plated steel in exposed locations.
 - 3. Furring, blocking, shims and hanging strips: softwood or hardwood lumber, kiln dried.
 - 4. Anchors: select material, type, size and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use non-ferrous metal or hot dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.
- F. Applied wall base: where noted in cabinet sections, apply vinyl wall base to toe-kick blocking. Refer to Section 096500 – Resilient Flooring.

2.6 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINET FABRICATION

- A. Cabinet quality standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for Custom grade of architectural plastic-laminate cabinets for construction, finishes, installation, and other requirements.
- B. Individual component quality standards: as specified in the relevant Article for those components.
- C. Type of Construction: Frameless.
- D. Cabinet doors and drawer fronts: 3/4 inch thick unless noted otherwise; flush overlay.
- E. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

SECTION 064116 – PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- F. Edging: Fit shelves, doors, and exposed edges with plastic laminate edging. Do not use more than one piece for any single length.
- G. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- H. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
- I. Shop-cut openings to maximum extent possible to receive plumbing fixtures, hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- J. Drawer Construction: Fabricate with exposed fronts fastened to sub-front with mounting screws from interior of body. Join sub-fronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- K. Fabricate cabinets to dimensions, profiles, and details indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.
- C. Verify adequacy of backing and support framing.
- D. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
- G. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
- H. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips, or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Adjust moving or operating parts to function smoothly and correctly.

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SECTION 064116 – PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION

CHASE
SECTION 066116 – SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 DEFINITIONS

- A. Solid surface material: nonporous homogenous material of consistent composition throughout of acrylic polymer, Aluminum Trihydrate filler and pigment.
- B.

1.2 SECTION INCLUDES

- A. Solid surface materials and assemblies for counter tops, splashes and aprons.
- B. Window stools.

1.3 RELATED SECTIONS

- A. 061000 – Rough Carpentry.
- B. 062000 – Finish Carpentry.
- C. 084113 – Aluminum-Framed Entrances and Storefronts.
- D. 092900 – Gypsum Board.

1.4 REFERENCES

- A. ASTM -84 Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.
- B. ASTM – D 638 – Standard Test Method for Tensile Properties of Plastic; current edition
- C. ASTM – D 2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; current edition.
- D. ASTM – D 696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degree C with a Vitreous Silica Dilatometer.
- E. ASTM – G 21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; current edition.
- F. ASTM – G 22 – Standard Practice for Determining Resistance of Plastics to Bacteria; current edition.
- G. ASTM – D 570 – Standard Test Method for Water Absorption of Plastics; current edition.
- H. ANSI Z124.3 / Z124.6 – Lavatory Compliance; current edition.
- I. UL – 723 – Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.

1.5 SUBMITTALS

- A. See Section 013000 – Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Specimen warranty and warranty conditions.
 - 5. Care and maintenance instructions and recommendations.
- C. Warranty: Submit manufacturer warranty and ensure that any required forms have been completed in Owner's name and registered with manufacturer.
- D. Shop Drawings: show location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
 - 1. Show full-size scale details, edge details, forming requirements, attachments, etc.
 - 2. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.

3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, grommets and other items installed in the solid surface.
 4. Produce drawings at minimum 1/2" = 1'-0" scale.
- E. Samples:
1. For each type of product indicated.
 - a. Submit minimum 6-inch by 6-inch sample in specified gloss.
 - b. Cut sample and seam together for representation of inconspicuous seam.
 - c. Indicate full range of color and pattern variation.
 2. Samples are to be reviewed and approved by the Architect of Record prior to fabrication.
 3. Approved samples will be retained as a standard for work.
- F. Maintenance data and supplies
1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
 2. Submit maintenance kit for finishes.
- G. Include in project closeout documents.

1.6 QUALITY ASSURANCE

- A. Fabricator / installer qualifications:
1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
 2. Member of International Cast Polymer Association (ICPA).
 3. Not less than 5 years experience in fabricating and installing products similar to those required for this project.
 4. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
- B. Installation and installed work shall comply with the following standards:
1. American National Standards Institute (ANSI)
 2. American Society for Testing and Materials (ASTM)
 3. National Electrical Manufacturers Association (NEMA)
- C. Installed work shall meet the following Class A fire test response characteristics per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame Spread Index: 25 or less.
 2. Smoke Developed Index: 450 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's protective containers.
- B. Store products indoors, under cover and elevated above grade.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- D. Handle materials to prevent damage to finished surfaces.
- E. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.8 1.7 WARRANTY

- A. Provide manufacturer's warranty against defects in materials.
1. Warranty shall provide material and labor to repair or replace defective materials.
 2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
- B. Fabrication and installation must be performed by a manufacturer's certified fabrication / installation contractor who will provide a brand plate for the application.
- C. Warranty shall cover all fabrication and installation performed by the certified fabricator / installer subject to the specific wording contained in the warranty card.
- D. Minimum manufacturer's warranty period: ten years from date of substantial completion.

CHASE
SECTION 066116 – SOLID SURFACING FABRICATIONS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. DuPont, www.dupont.com, Corian.
- B. Substitutions: not permitted.

2.2 MATERIALS

- A. Solid polymer components
 1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
 3. Color / pattern: refer to Finish Materials Schedule in drawings.
 4. Thickness: 1/2" or in built-up 1/2" thicknesses as indicated in drawings.
 5. Edge detail: as indicated in drawings.
 6. Dimensional tolerances: maximum deviation from thickness, width, and length of 0.01 inch.
 7. Splash installation type: applied.
- B. Performance characteristics
 1. Flammability: ASTM E 84, NFPA 255 and UL 723; Class I and Class A
 - a. Flame Spread Index: <25.
 - b. Smoke Developed Index: <25.

2.3 ACCESSORY MATERIALS

- A. Joint Adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
- B. Sealant: Manufacturer's standard mildew-resistant, UL-Listed latex-modified paintable silicone sealant in colors matching components.

2.4 FACTORY FABRICATION

- A. Shop Assembly:
 1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
 2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Reinforce with strip of solid polymer material, minimum 2 inches wide.
 3. Route and finish component edges with clean, sharp returns. Route cutouts, radii and contours to template. Smooth edges. Repair or reject defective or inaccurate work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present 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.

3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
 1. Provide product in the largest pieces available.
 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 3. Exposed joints/seams shall not be allowed.
 4. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 5. Cut and finish component edges with clean, sharp returns.

CHASE
SECTION 066116 – SOLID SURFACING FABRICATIONS

6. Rout radii and contours to template.
 7. Anchor securely to base cabinets or other supports.
 8. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 9. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 10. Install countertops with no more than 1/8 inch sag, bow or other variation from a straight line.
- B. Applied splashes:
1. Provide applied back and side splashes at all walls and adjacent millwork.
 2. Adhere splashes to countertops using manufacturer's standard color-matched silicone sealant.
- 3.3 CLEANING AND PROTECTION**
- A. Clean installed work to like-new condition.
 - B. Protect installed products until completion of project.
 - C. Touch-up, repair or replace damaged products before Substantial Completion.
 - D. Remove adhesives, sealants and other stains.

END OF SECTION

CHASE
SECTION 072113 - BOARD INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Extruded polystyrene rigid board insulation (XPS).
- B. Expanded polystyrene rigid board insulation (EPS).
- C. Polyisocyanurate rigid board insulation (POLYISO).

1.2 RELATED SECTIONS:

- A. 072117 – Fibrous Building Insulation.
- B. 072129 – Spray-Applied Cellulose Insulation.
- C. 072140 – Spray-Applied Foam Insulation.
- D. 072400 – Exterior Insulation and Finish System.
- E. 072500 – Weather Barriers.
- F. 075400 – Thermoplastic Membrane roofing.
- G. 098100 – Acoustic Insulation.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C272: Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions; latest edition.
 - 2. ASTM C518: Test Method for Steady-State Thermal Transmission Properties by means of the Heat Flow meter; latest edition.
 - 3. ASTM C578: Standard specification for Rigid, Cellular Polystyrene Thermal Insulation; latest edition.
 - 4. ASTM D1621: Test Method for Compressive Properties of Rigid Cellular Plastics; latest edition.
 - 5. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials; latest edition.

1.4 SUBMITTALS

- A. Submit manufacturer's product literature and installation instructions under provisions of Section 013300.

PART 2 - PRODUCTS

2.1 WALL EXTERIOR-FACE THERMAL INSULATION

- A. Product standard: ASTM C578, Type IV Extruded Polystyrene Board (XPS)
- B. Performance requirements and physical characteristics
 - 1. Thermal resistance (R-Value): Nominal board thickness 1.55" for R-Value of 10.1.
 - 2. Compressive strength: Minimum 15 psi per ASTM D1621.
 - 3. Water absorption: Maximum 0.10% per ASTM C272.
 - 4. Product configuration: 16" X 96" boards; butt edges; 1", 1 1/2" and 2" thicknesses as indicated in the drawings.
- C. Manufacturers, products
 - 1. Dow Chemical Co., www.dow.com, Thermax (ci) Exterior Insulation
 - 2. Substitutions: refer to Section 016000. Substitutions must provide Minimum R-10 in no more than 1.5 inches.

2.2 WALL INTERIOR-FACE THERMAL INSULATION

- A. Product standard: ASTM C578, Type X Extruded Polystyrene Board (XPS)
- B. Performance requirements and physical characteristics

CHASE
SECTION 072113 - BOARD INSULATION

1. Thermal resistance (R-Value): Minimum R-5.0 per inch per ASTM C518.
2. Compressive strength: Minimum 15 psi per ASTM D1621.
3. Water absorption: Maximum 0.10% per ASTM C272.
4. Product configuration: 23 7/8" X 96" boards; butt edges; 1 1/2" and 2" thicknesses as indicated in the drawings.

C. Manufacturers, products

1. Dow Chemical Co., www.dow.com, Styrofoam Z-Mate.
2. Owens Corning, www.owenscorning.com, Insulpink-Z.
3. Substitutions: refer to Section 016000.

2.3 FOUNDATION-FACE AND UNDER-SLAB THERMAL INSULATION

A. Product standard: ASTM C578, Type IV Extruded Polystyrene Board (XPS)

B. Performance requirements and physical characteristics

1. Thermal resistance (R-Value): Minimum R-5.0 per inch per ASTM C518.
2. Compressive strength: Minimum 25 psi per ASTM D1621.
3. Water absorption: Maximum 0.30% per ASTM C272.
4. Product configuration: 2" thick x 24" wide x 96" long boards; ship-lap or tongue-and-groove edges.

C. Manufacturers, products

1. Dow Chemical Co., www.dow.com, Styrofoam Perimate
2. Owens Corning, www.owenscorning.com, Foamular 250.
3. Substitutions: refer to Section 016000.

2.4 ROOF DECK THERMAL INSULATION

A. Refer to Section 075400 – Thermoplastic Membrane Roofing.

2.5 EXTERIOR INSULATION AND FINISH SYSTEM THERMAL INSULATION

A. Refer to Section 072400 – Exterior Insulation and Finish systems.

B. Refer to Section 092423 – Portland Cement Stucco.

2.6 ACCESSORIES

- A. Impaling Pins: 12 gage pins, length as necessary for penetration through insulation; heads for attachment to deck; circular clinch shields.
- B. Adhesive: Type recommended by insulation manufacturer for application; compatible with insulation and substrate.
- C. Furnish other accessories, not specifically described but required for a complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adjacent materials are secure, properly spaced, dry, and ready to receive installation.
- B. Verify rough ducting, piping and conduit systems for mechanical, electrical, data and other services within spaces to be insulated have been installed and tested.
- C. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence. Notify the General Contractor of conditions detrimental to the proper and timely completion of the work.
- D. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

CHASE
SECTION 072113 - BOARD INSULATION

3.2 RIGID INSULATION AT WALLS

- A. Except as otherwise indicated or specified, install insulation in accordance with the manufacturer's current installation instructions.
- B. Trim insulation to tightly fit between the furring and framing and to fit around penetrations.
- C. At Locations Where No Framing is Present:
 - 1. Mechanically or adhesively bond impaling pins to the substrate in accordance with the manufacturer's recommendations. Spot weld pins to bottom flutes of metal deck.
 - 2. Space pins at maximum 24 inches on center along the edges and within the field of the board. Place edge pins within 6 inches from the edge of the board
 - 3. Install boards tightly butted. Impale boards and secure with clinch shields, set to hold boards in contact with deck.
 - 4. Repair all fireproofing damaged by installation of insulation, as necessary to restore fire rating.

3.3 PERIMETER AND UNDER-SLAB INSULATION

- A. Place perimeter insulation as indicated. Joints shall be tightly butted.
- B. Secure the insulation in position sufficiently to hold the material in place against retaining walls, prior to and during backfill operations.
- C. Do not damage waterproofing system.
- D. Install polystyrene perimeter insulation over compacted granular fill as detailed, prior to installation of slab on grade.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fibrous thermal batt and roll insulation.

1.2 RELATED SECTIONS:

- A. 054000 – Cold Formed Metal Framing.
- B. 061000 – Rough Carpentry.
- C. 072113 – Board Insulation.
- D. 072500 – Weather Barriers.
- E. 092200 – Lightgage Metal Support Framing.
- F. 098100 – Acoustic Insulation.
- G. 230713 – Duct Insulation.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; latest edition.
 - 2. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; latest edition.
 - 3. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials; latest edition.
- B. Life Safety Code; National Fire Protection Association; latest edition.
- C. UL 2079: Standard Test Method for Fire Resistance of Building Joint Systems; latest edition.

1.4 SUBMITTALS

- A. Make submittals under provisions of Section 013300.
- B. Product Data: Submit manufacturer's product data and installation instructions for each type of insulation.

1.5 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturers of all products in this section shall have a minimum 10 years experience manufacturing these products.
- B. Installer qualifications: Products listed in this section shall be installed by a single organization with at least 5 years experience successfully installing these products on projects of a similar size and scope.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.
- C. Handling: Handle materials in such a manner as to avoid damage.

1.7 SEQUENCING

- A. Coordinate with the installation of vapor retarders and air seal materials specified in Section 072500 – Weather Barriers.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Kraft-faced batt and blanket insulation:
 - 1. Type: ASTM C665, Type II, Class C, Category 1; preformed, faced on one side with Kraft paper providing a vapor barrier of 1.0 or less, glass fiber batts.
 - 2. Flame spread 25 or less and smoke developed of 50 or less when tested in accordance with ASTM E84.
 - 3. Thermal resistance (R-value): as indicated on the drawings, or if not indicated, the maximum R-Value product available for the indicated size.
 - 4. Furnish oversize widths for friction-fit between metal framing members.
 - 5. Manufacturer, products
 - a. Basis of Design: Johns Manville Corp.
 - b. Acceptable Options (subject to compliance with Contract Document requirements and Architect's approval of conformance to design intent.):
 - 1) CertainTeed Corporation: www.certainteed.com.
 - 2) Knauf Insulation, www.knaufinsulation.us.
 - 3) Owens Corning Corp: www.owenscorning.com.
 - 4) Substitutions: refer to Section 016000.

2.2 ACCESSORIES

- A. Vapor retarder: refer to Section 072500.
- B. Impaling Pins: 12 gage pins; length as required with mounting plates for welding or adhesive mounting; include retainer shields.
- C. Provide other accessories, not specifically described, but required for secure and tight installation of insulation with complete insulation fill within cavities, and continuous vapor retarder.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify adjacent materials are secure, properly spaced, dry, and ready to receive installation.
- B. Verify mechanical and electrical services within spaces to insulated have been installed and tested.
- C. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the General Contractor of conditions detrimental to the proper and timely completion of the work.
- D. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION

- A. Install batt insulation in accordance with manufacturer's instructions.
- B. Install insulation without gaps or voids.
- C. Trim insulation neatly to fit spaces. Use batts free of damage.
- D. At metal stud framing, insert the insulation edges tightly into the stud channels for a friction fit. Provide additional supports as necessary to prevent sliding of batts in the stud cavity.

CHASE

SECTION 072117 - FIBROUS BUILDING INSULATION

- E. Fill voids in framing members, such as hollow spaces in metal framing box beams, to provide a continuous thermal envelope.
- F. Mechanical Fastening:
 - 1. At locations where no framing is present to support the insulation, provide impaling pins and retainers to hold the insulation firmly in position.
 - 2. Mechanically or adhesively bond the impaling pins to the substrate in accordance with the manufacturer's recommendations.
 - 3. Space pins at maximum 24 inches on center along the edges and within the field of the blanket. Place edge pins within 6 inches from the edge of the batt.
- G. Pack batt insulation in shim spaces at perimeter of window assembly to maintain continuity of thermal barrier.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Sprayed cellulose thermal insulation.

1.2 RELATED SECTIONS:

- A. 053100 – Steel Decking.
- B. 054000 – Cold Formed Metal Framing.
- C. 061000 – Rough Carpentry.
- D. 072500 – Weather Barriers.
- E. 092200 – Lightgage Metal Support Framing.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM); latest edition unless noted otherwise:
 - 1. ASTM C739 – *Standard Specification for Cellulosic Fiber Loose-fill Thermal Insulation*.
 - 2. ASTM E736: *Standard Test Method for Cohesion / Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members*.
 - 3. ASTM E84 - *Test Method for Surface Burning Characteristics of Building Materials*.
 - 4. ASTM E759 – *Standard Test Method for Effects of Deflection on Sprayed Fire-Resistive Materials Applied to Structural Members*.
- B. International Code Council
 - 1. *International Building Code*, latest edition.

1.4 SUBMITTALS

- A. Provide submittals per the provisions of Section 013300.
- B. Submit manufacturer's product data indicating that the product meets or exceeds the following requirements:
 - 1. ASTM E736: bond strength greater than 100psf.
 - 2. ASTM E84: Class 1 / Class A.
 - 3. ASTM C739: non-corrosive.
 - 4. ASTM E759: 6" deflection in 10' span- no spalling or delamination.
 - 5. IBC 803.3: complies with stability requirements for interior finishes.
- C. Minimum recycled fiber content shall be 75%.
- D. Manufacturer's written certification that the product contains no asbestos, fiberglass or other man-made mineral fibers, or urea-formaldehyde resins.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver in original, unopened containers bearing the name of the manufacturer, product identification and reference to U.L. or other laboratory testing conforming to the ASTM standards indicated above.
- B. Store materials dry, off ground, and under cover.
- C. Protect liquid adhesive from freezing.

1.6 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.
- B. Installer qualifications.
 - 1. Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope.
 - 2. Installer must be licensed by the product manufacturer.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not apply insulation when substrate temperatures are under 40 deg. F (4.4 deg. C) prior to installation.
- C. Surfaces must be dry prior to product spray application. Excess humidity may cause poor adhesion and result in product failure.
- D. To avoid overspray, product should not be applied in windy conditions.

1.8 SEQUENCING

- A. Coordinate with the installation of vapor retarders and air seal materials specified in Section 072500 – Weather Barriers.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. International Cellulose Corporation; www.spray-on.com.
- B. Nu-Wool Company; www.nuwool.com.
- C. United Fibers; <http://www.unitedfibers.com/contractors>
- D. Substitutions: refer to Section 016000.

2.2 INSTALLERS

- A. As recommended by the selected manufacturer.

2.3 MATERIALS

- A. Stabilized low-dust spray-applied cellulose thermal insulation in compliance with the Submittals section.
- B. Select materials in compliance with building codes enforced by the jurisdiction where the material is installed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions. Work in the application area required to be complete by others prior to the work in this section includes:
 - 1. Roof and deck penetrations.
 - 2. Clips, hangers, supports, sleeves and other attachments to substrates.
 - 3. All other thermal insulation.
- B. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.
- C. Verify adjacent materials are secure, properly spaced, dry, and ready to receive installation.
- D. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the General Contractor of conditions detrimental to the proper and timely completion of the work.

CHASE

SECTION 072129 – SPRAY-APPLIED CELLULOSE BUILDING INSULATION

- E. Examine surfaces to receive spray insulation to determine if priming / sealing is required to ensure bonding and/or prevent discoloration caused by migratory stains.

3.2 PREPARATION

- A. Provide masking, drop cloths or other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray.
- B. Coordinate installation of the sprayed cellulose fiber with work of other trades.
- C. Prime surfaces as required by manufacturer's instructions or as determined by examination.

3.3 INSTALLATION

- A. Install spray applied insulation according to manufacturer's recommendations.
- B. Install spray applied insulation to achieve an average thermal resistance value of R-38 at roof areas and R-21 at wall areas, unless indicated otherwise in the drawings.
- C. Cure insulation with continuous natural or mechanical ventilation.
- D. Re-cycle on-site or remove and dispose of over-spray.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Closed cell spray foam insulation.

1.2 RELATED SECTIONS:

- A. 053100 – Steel Decking.
- B. 054000 – Cold Formed Metal Framing.
- C. 061000 – Rough Carpentry.
- D. 072500 – Weather Barriers.
- E. 092200 – Lightgage Metal Support Framing.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM); latest edition unless noted otherwise:
 - 1. ASTM C518 - *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.*
 - 2. ASTM C177 - *Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.*
 - 3. ASTM C1029 - *Standard Specification for Spray-Applied Rigid Polyurethane Thermal Insulation.*
 - 4. ASTM E 84 - *Standard Test Method for Surface Burning Characteristics of Building Materials.*
 - 5. ASTM E 96 - *Standard Test Methods for Water Vapor Transmission of Materials.*
 - 6. ASTM D 1621 - *Standard Test Method for Compressive Properties of Rigid Cellular Plastics.*
 - 7. ASTM D 1622 - *Standard Test Method for Apparent Density of Rigid Cellular Plastics.*
 - 8. ASTM D 1623 - *Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.*
 - 9. ASTM D 2126 - *Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.*
 - 10. ASTM D 2842 - *Standard Test Method for Water Absorption of Rigid Cellular Plastics.*
- B. International Code Council
 - 1. *International Building Code*, latest edition.

1.4 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for flame and smoke, concealment, and over coat requirements.

1.5 SUBMITTALS

- A. Provide submittals per the provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.
- B. Installer qualifications: Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope as specified in this section.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Storage: Store materials in dry locations with adequate ventilation, protected from freezing rain, direct sunlight and excess heat and in such a manner to permit easy access for inspection and handling. Store at temperature between 55 and 80 degrees F (12.7 to 26.6 degrees C).
- C. Handling: Handle materials to avoid damage.

1.8 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.
- B. Installer qualifications.
 - 1. Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope.
 - 2. Installer must be licensed by the product manufacturer.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not apply insulation when substrate temperatures are under 40 deg. F (4.4 deg. C) prior to installation.
- C. Surfaces must be dry prior to product spray application. Excess humidity may cause poor adhesion and result in product failure.
- D. To avoid overspray, product should not be applied in windy conditions.

1.10 SEQUENCING

- A. Coordinate with the installation of vapor retarders and air seal materials specified in Section 072500 – Weather Barriers.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 - PRODUCTS**2.1 MANUFACTURERS, PRODUCTS**

- A. CertainTeed Corporation: Certa-Spray; www.certainteed.com/products/insulation/spray-foam-insulation/317388.
- B. Dow Chemical Company: Styrofoam MX-Series; www.dow.com.
- C. Substitutions: refer to Section 016000.

2.2 MATERIALS

- A. Spray-applied closed-cell foam thermal insulation.
 - 1. Physical and mechanical properties.
 - a. Core density: 1.9 pcf minimum per ASTM D1622.
 - b. Stabilized thermal resistance (R-Value): R-6 minimum per inch per ASTM C518.
 - c. Closed cell content: 88 % minimum per ASTM D2842.
 - d. Compressive strength: 25 psi minimum per ASTM D1621.
 - e. Tensile Strength: 23 psi minimum per ASTM D1623.
 - f. Water Absorption: Less than 2 percent by volume per ASTM D2842.
 - g. Dimensional Stability: Less than 9 percent by volume per ASTM D2126 at 75 degrees F/95 percent RH, 28 Days.

- h. Water Vapor Transmission: 2.2 perm/inch maximum when tested in accordance with ASTM E96.
- i. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C1338.
- 2. Fire performance
 - a. Flame Spread: Less than 25 per ASTM E84.
 - b. Smoke: Less than 450 per ASTM E84.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that all exterior and interior wall, partition, and floor/ceiling assembly construction has been completed to the point where the insulation may correctly be installed.
- C. Verify that substrate and cavities are dry and free of any foreign material that will impede application.
- D. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.
- E. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Mask and protect adjacent surfaces from overspray or dusting.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Product must be installed according to local code, and must be applied by a qualified applicator.
- B. Apply insulation by spray method, to uniform monolithic density without voids.
- C. Apply to minimum cured thickness as indicated on the drawings or as required to achieve compliance with building, mechanical and energy codes applicable to the project.
- D. Apply to achieve thermal resistance (R-value) of R-38 at roof installations and R-21 at wall installations unless noted otherwise in the drawings.
- E. Apply insulation to seal voids at truss ends to prevent wind scouring of ceiling insulation.
- F. Seal plumbing stacks, electrical wiring and other roof and wall penetrations.
- G. Apply insulation to fill voids around accessible service and equipment penetrations. Request General Contractor to provide, where required, baffles or blocking to prevent spray-applied insulation from impeding access to equipment service areas.
- H. Do not install spray foam insulation in areas where it will be in contact with equipment or materials with operating temperatures of 180 degrees F (82 degrees C) or greater.
- I. Apply insulation in unvented roof spaces.

3.4 FIELD QUALITY CONTROL

- A. Inspection will include verification of insulation and density.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

CHASE
SECTION 072140 – SPRAY-APPLIED FOAM BUILDING INSULATION

END OF SECTION

CHASE
SECTION 072400 - EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exterior insulation and finish system for walls and soffits.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Sheathing.
- B. 061643 – Exterior Gypsum Sheathing.
- C. 072500 – Weather Barriers.
- D. 072423 – Direct-Applied Exterior Finish Systems.
- E. 076200 – Flashing and Sheet Metal Trim.
- F. 079200 – Joint Sealants.
- G. 081113 – Hollow Metal Doors and Frames.
- H. 084113 – Aluminum-Framed Entrances and Storefronts.
- I. 084400 – Curtain Wall and Glazed Assemblies.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. B 117: Test Method for Salt Spray (Fog) Testing; latest edition.
 - 2. C 578: Specification for Preformed, Cellular Polystyrene Thermal Insulation; latest edition.
 - 3. C 1177: Specification for Glass Mat Gypsum for Use as Sheathing; latest edition.
 - 4. C 1382: Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints; latest edition.
 - 5. D 522: Test Methods for Mandrel Bend Test of Attached Organic Coatings; latest edition.
 - 6. D 882: Standard Test Methods for Tensile Properties of Thin Plastic Sheeting; latest edition.
 - 7. D 968: Test Method for Abrasion Resistance of Organic Coatings by Falling Abrasive; latest edition.
 - 8. D 1784: Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds; latest edition.
 - 9. D 2247: Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; latest edition.
 - 10. D 3273: Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; latest edition.
 - 11. E 84: Test Method for Surface Burning Characteristics of Building Materials; latest edition.
 - 12. E 96: Test Methods for Water Vapor Transmission of Materials; latest edition.
 - 13. E 119: Method for Fire Tests of Building Construction and Materials; latest edition.
 - 14. E 283: Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen; latest edition.
 - 15. E 330: Test Method for Structural Performance of Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference; latest edition.
 - 16. E 331: Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; latest edition.
 - 17. E 1233: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference; latest edition.
 - 18. E 2098: Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish System after Exposure to a Sodium Hydroxide Solution; latest edition.
 - 19. E 2134: Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS); latest edition.
 - 20. E 2273: Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish System (EIFS) Clad Wall Assemblies; latest edition.

SECTION 072400 - EXTERIOR INSULATION AND FINISH SYSTEM

21. E 2430: Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for use in Exterior Insulation and Finish Systems (EIFS); latest edition.
22. E 2485: Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings; latest edition.
23. E 2486: Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS); latest edition.
24. E 2570: Test Method for Water-Resistive (WRB) Coatings used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage; latest edition.
25. G 153: Recommended Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials; latest edition.
26. G 154: Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials; latest edition.

1.4 Building Code Standards

- A. AC235: Acceptance Criteria for EIFS Clad Drainage Wall Assemblies; International Code Council Evaluation Service (ICC-ES); latest edition.
- B. National Fire Protection Association (NFPA)
 1. NFPA 268, "Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source"; latest edition.
 2. NFPA 285, "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus"; latest edition.

1.5 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Manufacturer's specifications, details, installation instructions and product data.
 1. Manufacturer's code compliance report.
 2. Manufacturer's standard warranty.
 3. Manufacturer's certificate of compliance with EIMA standards.
 4. Manufacturer's report indicating satisfactory results of required testing procedures.
- C. Installer's qualifications documentation.
- D. Samples: For selection of finish coat colors and textures.

1.6 QUALITY ASSURANCE

- A. EIFS Manufacturer Qualifications:
 1. Member in good standing of the EIFS Industry Members Association (EIMA).
 2. System manufacturer for a minimum of twenty (20) years.
 3. Manufacturer's wall assembly listed in Gypsum Association Fire Resistance Design Manual.
- B. Installer Qualifications:
 1. Engaged in application of EIFS for a minimum of three (3) years.
 2. Knowledgeable in the proper use and handling of the materials specified and listed by the material manufacturer as having attended manufacturer-provided continuing education.
 3. Employ skilled mechanics who are experienced and knowledgeable in EIFS application, and familiar with the requirements of the specified work.
 4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
 5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with EIFS manufacturer's published specifications and details and the project plans and specifications.
- C. Insulation Board Manufacturer Qualifications:
 1. Recognized by EIFS manufacturer as capable of producing insulation board to meet system requirements and holding a valid licensing agreement with EIFS manufacturer.
 2. Listed by an approved agency.
 3. Providing insulation board labeled with information required by EIFS manufacturer, the approved listing agency and the applicable building code.

- D. Inspections: Visual and documented inspections shall coincide with Pre-construction meeting, moisture barrier application, foam application, and basecoat application. Provide inspections by proprietary EIFS product representative.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings (pail products) from freezing and temperatures in excess of 90 degrees F. Store away from direct sunlight.
- C. Protect Portland cement-based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.8 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's 15-year labor and material warranty:

PART 2 - PRODUCTS

2.1 MANUFACTURERS, PRODUCTS

- A. EIFS
 - 1. Furnish EIFS materials from a single manufacturer or approved supplier.
 - 2. Manufacturers include but are not limited to:
 - a. Sto Corporation; www.stocorp.com
 - 1) StoTherm ci Lotusan (basis of design).
 - b. Dryvit Systems, Inc.; www.dryvit.com
 - c. Parex USA, Inc.; www.parex.com.
 - d. BASF Senergy Wall Systems; www.senergy.basf.com
 - e. Substitutions: refer to Section 016000.
- B. Accessories:
 - 1. Provide metal beads, starter tracks, screeds, reveals and other components as indicated in the drawings or as required for a complete systems recommendation
 - 2. Furnish accessories from the EIFS system manufacturer or a single manufacturer or supplier approved by the EIFS system manufacturer.

2.2 MATERIALS

- A. Air and Water-Resistive Barrier: Either sheet-type material that constitutes an air retarder, but which is vapor permeable or fluid applied type as provided by EIFS system manufacturer and applicator as part of a single source warranted installation. Refer to Section 076200 – Weather Barriers.
- B. Insulation Board Adhesive: Provide adhesives as directed by the EIFS manufacturer and compatible with the insulation board and weather barrier for the project's climate.
- C. Insulation Board
 - 1. Expanded polystyrene (EPS) compliant with ASTM C578 Type I specifications and EIMA Guideline Specification for Expanded Polystyrene (EPS).
 - 2. Physical and performance criteria
 - a. Density: 1.0 lb./cu.ft. minimum.
 - b. Flame spread: Class A, 25 minimum per ASTM E84.
 - c. Smoke developed: Class A, 450 minimum per ASTM E84.
 - d. Compressive strength: 10psi minimum per ASTM E2430.
- D. Base Coat: One-component polymer modified cement based high build base coat with less than 33 percent Portland cement content by weight and capable of achieving minimum 1/16 inch thickness in one pass.
- E. Reinforcing Mesh

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SECTION 072400 - EXTERIOR INSULATION AND FINISH SYSTEM

1. High Impact Reinforcing Mesh: Nominal 15 oz/sq yd, ultra-high impact, double strand, interwoven, open-weave glass fiber fabric with alkaline resistant coating for compatibility with EIFS coating materials; capable of achieving EIMA Ultra-High Impact Classification when applied beneath standard mesh. Install to minimum height of 6 feet above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact.
 2. Standard Reinforcing Mesh: Nominal 4.5 oz/sq yd, symmetrical, interlaced open-weave glass fiber fabric made with minimum 20 percent by weight alkaline resistant coating for compatibility with EIFS coating materials; capable of achieving EIMA Standard Impact Classification. Install at all areas other than those covered by High Impact reinforcing Mesh.
- F. Waterproof Base Coat: Two component fiber reinforced acrylic based waterproof base coat mixed with Portland cement. Watertight Coat is an acceptable substitute.
1. Use on horizontal and sloped surfaces that project more than 2 inches from face of wall.
- G. Primer: Required as part of the system: Acrylic based tinted primer.
- H. Finish Coat: Silicone enhance textured wall coating with graded marble aggregate.
1. Color: As indicated on drawings.
 2. Marble Color: As indicated on drawings.
- I. Water: Clean and potable.
- J. Joint Sealant: Non-sag polyurethane sealant that has 50 percent elongation after conditioning, when tested in accordance with ASTM C 1382; compatible with EIFS materials and with compatible backer rod. Refer to Section 079200.

PART 3 - EXECUTION

3.1 COORDINATION

- A. EIFS installer shall provide coordination with installers of related and adjacent materials to ensure that:
1. Finish grading of site is such that EIFS terminates above finished grade a minimum of 8 inches (203 mm) or as required by code.
 2. Penetrations through wall are protected from weather prior to installation of windows, doors, and other closures.
 3. Sill flashing is provided at all openings.
 4. Head flashing is installed immediately after windows and doors are installed.
 5. Diverter flashings are installed wherever water can enter the wall assembly to direct water to the exterior.
 6. Copings and related sealant are installed immediately after installation of EIFS when EIFS coatings are dry.
 7. Penetrations are attached using fasteners through EIFS to structural support, with watertight seal.

3.2 INSTALLATION

- A. Install EIFS in accordance with manufacturer's published instructions.
- B. Apply all materials listed in Materials section of this specification in the order of progression as listed in the Materials section.
- C. Trowel Insulation board adhesive vertically using notched channel for vertical drainage application.
- D. Use Base Coat for general application. Substitute Waterproof Base Coat as needed according to manufacturer's recommendations or as directed in the Materials Article above.
- E. Provide minimum 3/4 inch wide expansion joints through EIFS where moving joints exist in the substrate or supporting construction, where EIFS adjoins dissimilar construction or materials, at changes in building height, and at floor lines in multi-level frame construction.
- F. Provide minimum 1/2 inch wide sealant joints at all penetrations through the EIFS (windows, doors, etc.).
- G. Provide joints with secondary moisture protection and drain to the exterior.

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SECTION 072400 - EXTERIOR INSULATION AND FINISH SYSTEM

3.3 PROTECTION

- A. Protect installed materials from water infiltration into or behind them.
- B. Protect installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

END OF SECTION

CHASE
SECTION 072423 – DIRECT-APPLIED EXTERIOR FINISH SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Materials and installation of non-insulated exterior finish system for direct application to substrates at soffits and weather-protected areas.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Sheathing.
- B. 072400 – Exterior Insulation and Finish Systems.
- C. 072500 – Weather Barriers.
- D. 076200 – Flashing and Sheet Metal Trim.
- E. 079200 – Joint Sealants.
- F. 084113 – Aluminum-Framed Entrances and Storefronts.
- G. 084400 – Curtain Wall and Glazed Assemblies.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. C 150: Specification for Portland Cement; latest edition.
 - 2. C 297: Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; latest edition.
 - 3. C 1177: Specification for Glass Mat Gypsum for Use as Sheathing; latest edition.
 - 4. D 1784: Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds; latest edition.
 - 5. D 3273: Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; latest edition.
 - 6. E 84: Test Method for Surface Burning Characteristics of Building Materials; latest edition.
 - 7. E 2486: Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS); latest edition.
 - 8. G 153: Recommended Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials; latest edition.
- B. Gypsum Association:
 - 1. 1.GA-600 Fire Resistance Design Manual; latest edition.
 - 2. 2.GA-253 Application of Gypsum Sheathing; latest edition.
 - 3. 3.GA-254 Fire Resistant Gypsum Sheathing; latest edition.
- C. International Code Council Evaluation Service (ICC-ES)
 - 1. AC 59, Acceptance Criteria for Direct-Applied Exterior Finish Systems (DEFS)

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Manufacturer's specifications, details, installation instructions and product data.
 - 1. Manufacturer's code compliance report.
 - 2. Manufacturer's standard warranty.
 - 3. Manufacturer's certificate of compliance with EIMA standards.
 - 4. Manufacturer's report indicating satisfactory results of required testing procedures.
- C. Installer's qualifications documentation.
- D. Samples: For selection of finish coat colors and textures.

1.5 QUALITY ASSURANCE

- A. EIFS Manufacturer Qualifications:
 - 1. Member in good standing of the EIFS Industry Members Association (EIMA).

SECTION 072423 – DIRECT-APPLIED EXTERIOR FINISH SYSTEM

2. System manufacturer for a minimum of twenty (20) years.
3. Manufacturer's wall assembly listed in Gypsum Association Fire Resistance Design Manual.
- B. Installer Qualifications:
 1. Engaged in application of EIFS for a minimum of three (3) years.
 2. Knowledgeable in the proper use and handling of the materials specified and listed by the material manufacturer as having attended manufacturer-provided continuing education.
 3. Employ skilled mechanics who are experienced and knowledgeable in EIFS application, and familiar with the requirements of the specified work.
 4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
 5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with EIFS manufacturer's published specifications and details and the project plans and specifications.
- C. Inspections: Visual and documented inspections shall coincide with Pre-construction meeting, moisture barrier application, foam application, and basecoat application. Provide inspections by proprietary EIFS product representative.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect coatings (pail products) from freezing and temperatures in excess of 90 degrees F. Store away from direct sunlight.
- C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.7 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's 15 year labor and material warranty.

1.8 COORDINATION SCHEDULING

- A. Install flashings, copings and sealant immediately after installation of the system and when coatings are dry

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Direct-Applied Exterior Finish System
 1. Provide components from single source manufacturer or approved supplier.
 2. Manufacturers
 - a. Sto Corporation; www.stocorp.com (basis of design).
 - b. Dryvit Systems, Inc.; www.dryvit.com
 - c. Parex USA, Inc.; www.parex.com.
 - d. BASF Senergy Wall Systems; www.senergy.basf.com
 - e. Substitutions: refer to Section 016000.
- B. Accessories:
 1. Provide metal beads, starter tracks, screeds, reveals and other components as indicated in the drawings or as required for a complete systems recommendation
 2. Furnish accessories from the EIFS system manufacturer or a single manufacturer or supplier approved by the EIFS system manufacturer.

2.2 MATERIALS

- A. Air and Water-Resistive Barrier: Either sheet-type material that constitutes an air retarder but which is vapor permeable or fluid applied type as provided by EIFS system manufacturer and applicator as part of a single source warranted installation. Refer to Section 076200 – Weather Barriers.

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SECTION 072423 – DIRECT-APPLIED EXTERIOR FINISH SYSTEM

- B. Base Coat: One-component polymer modified cement-based factory blend base coat with less than 33 % Portland cement content by weight.
- C. Reinforcing Mesh: Nominal 4.5 oz/sq yd, symmetrical, interlaced open-weave glass fiber fabric made with minimum 20 percent by weight alkaline resistant coating for compatibility with EIFS coating materials; capable of achieving EIMA Standard Impact Classification.
- D. Waterproof Base Coat: Two component fiber reinforced acrylic based waterproof base coat mixed with Portland cement. Watertight Coat is an acceptable substitute.
 - 1. Use on horizontal and sloped surfaces that project more than 2 inches from face of wall.
- E. Primer: Required as part of the system: Acrylic based tinted primer.
- F. Finish Coat: Silicone enhance textured wall coating with graded marble aggregate.
 - 1. Color: As indicated on drawings.
 - 2. Marble Color: As indicated on drawings.
- G. Water: Clean and potable.
- H. Joint Sealant: Non-sag polyurethane sealant that has 50 percent elongation after conditioning, when tested in accordance with ASTM C 1382; compatible with EIFS materials and with compatible backer rod. Refer to Section 079200.

PART 3 - EXECUTION

3.1 COORDINATION

- A. EIFS installer shall provide coordination with installers of related and adjacent materials to ensure that:
 - 1. Finish grading of site is such that EIFS terminates above finished grade a minimum of 8 inches (203 mm) or as required by code.
 - 2. Penetrations through wall are protected from weather prior to installation of windows, doors, and other closures.
 - 3. Sill flashing is provided at all openings.
 - 4. Head flashing is installed immediately after windows and doors are installed.
 - 5. Diverter flashings are installed wherever water can enter the wall assembly to direct water to the exterior.
 - 6. Copings and related sealant are installed immediately after installation of EIFS when EIFS coatings are dry.
 - 7. Penetrations are attached using fasteners through EIFS to structural support, with watertight seal.

3.2 INSTALLATION

- A. Install finish system in accordance with manufacturer's published instructions.
- B. Apply all materials listed in Materials section of this specification in the order of progression as listed in the Materials section.
- C. Use Base Coat for general application. Substitute Waterproof Base Coat as needed according to manufacturer's recommendations or as directed in the Materials Article above.
- D. Provide minimum 3/4 inch wide expansion joints through EIFS where moving joints exist in the substrate or supporting construction, where EIFS adjoins dissimilar construction or materials, at changes in building height, and at floor lines in multi-level frame construction.
- E. Provide minimum 1/2 inch wide sealant joints at all penetrations through the EIFS (windows, doors, etc.).
- F. Provide joints with secondary moisture protection and drain to the exterior.

3.3 PROTECTION

- A. Provide protection of installed materials from water infiltration into or behind them.

CHASE

SECTION 072423 – DIRECT-APPLIED EXTERIOR FINISH SYSTEM

- B. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

END OF SECTION

CHASE
SECTION 072500 – WEATHER BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water-resistive barriers.
- B. Air barriers.
- C. Vapor retarders.

1.2 RELATED SECTIONS

- A. 033000 – Cast-In-Place Concrete: under-slab vapor retarder.
- B. 061000 – Rough Carpentry: air infiltration barrier.
- C. 072117 – Fibrous Building Insulation: Vapor retarder installed in conjunction with batt insulation.
- D. 072129 – Spray-Applied Cellulose Insulation.
- E. 072140 – Spray-Applied Foam Insulation.
- F. 072400 – Exterior Insulation and Finish Systems.
- G. 072423 – Direct-Applied Exterior Finish Systems.
- H. 075400 – Thermoplastic Membrane Roofing: Vapor retarder installed as part of roofing system.
- I. 072900 – Joint Sealants: Sealant materials and installation techniques.

1.3 DEFINITIONS

- A. Weather Barrier: Assemblies that form water-resistive barriers, vapor retarders, or air barriers.
- B. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to the degree specified, intended to be installed to shed water without sealed seams.
- C. Air Barrier: Air-tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
- D. Vapor Retarder: Air-tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
 - 1. Water Vapor Permeance: For purposes of conversion, $57.2 \text{ ng}/(\text{Pa s sq m}) = 1 \text{ perm}$.

1.4 REFERENCES

- A. U.S. Code of Federal regulations (CFR)
 - 1. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; latest edition.
- B. American Association of Textile Chemists and Colorists (AATCC)
 - 1. AATC Technical Manual; latest edition.
 - 2. AATCC Test Method 30 - Antifungal Activity, Assessment on Textile Materials: Mildew and Rot Resistance of Textile Materials; latest edition.
 - 3. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; latest edition.
- C. American Society for Testing and Materials (ASTM)
 - 1. ASTM C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; latest edition.
 - 2. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; latest edition.
 - 3. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; latest edition.
 - 4. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; latest edition.

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SECTION 072500 – WEATHER BARRIERS

5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; latest edition.
6. ASTM E96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; latest edition.
7. ASTM E 2178 - Standard Test Method for Air Permeance of Building Materials; latest edition.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics indicating compliance with the referenced standards or test results.
- C. Manufacturer's Installation Instructions: Indicate preparation and installation methods.

PART 2 - PRODUCTS

2.1 WEATHER BARRIER ASSEMBLIES

- A. A continuous, uninterrupted weather barrier system is required in all building envelope assemblies.
- B. The weather barrier system shall be designed for specific types of construction in response to prevailing climatic conditions. Coordinate with exterior finish system manufacturer's requirements or recommendations for types and placements.

2.2 WATER-RESISTIVE AIR BARRIER MATERIALS (VAPOR-PERMEABLE)

- A. Air Barrier Sheet, Mechanically Fastened:
 1. Air Permeance: 0.004 cubic feet per square foot, maximum, when tested in accordance with ASTM E 2178.
 2. Water vapor permeance: 20 perms, minimum, when tested in accordance with ASTM E96/E 96M Procedure A (desiccant method).
 3. Water penetration resistance: Withstand a water head of 21 inches, minimum, for minimum of 5 hours, when tested in accordance with AATCC 127.
 4. Ultraviolet and weathering resistance: Approved in writing by manufacturer for minimum of 4 months weather exposure.
 5. Surface burning characteristics: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E 84.
 6. Products
 - a. DuPont Company; www.dupont.com; Tyvek CommercialWrap D.
 - b. Pactiv GreenGuard; www.trustgreenguard.com; RainDrop3D.
 - c. Substitutions: refer to Section 016000.
- B. Air Barrier Coating: Cold-fluid-applied, vapor permeable, elastomeric waterproofing membrane.
 1. Material: Water-based acrylic or polymer-modified bitumen, with VOC content of zero.
 2. Adhesion to paper and glass mat faced sheathing: Sufficient to ensure against failure due to delamination of sheathing.
 3. Dry film thickness: 10 mils (0.010 inch), minimum.
 4. Air permeance: 0.004 cubic feet per square foot, maximum, when tested in accordance with ASTM E 2178.
 5. Water vapor permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E 96M.
 6. Products
 - a. Sto Corporation; www.stocorp.com; StoGuard
 - b. DuPont Company; www.dupont.com; Tyvek Fluid-applied WB System.
 - c. Substitutions: refer to Section 016000.

2.3 VAPOR BARRIER MATERIALS (VAPOR, AIR, AND WATER-IMPERMEABLE)

- A. Class I vapor retarders (Barriers) (<0.1 perm) shall be used in wall and roof assemblies only where prevailing climatic conditions indicate their use.
- B. Class I vapor retarders shall be installed only where Class II vapor retarders would not provide satisfactory performance.

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SECTION 072500 – WEATHER BARRIERS

- C. Class II vapor retarders shall be installed only where Class III vapor retarders would not provide satisfactory performance.
- D. Vapor barrier sheet: 10 mil minimum polyethylene sheet, edges lapped and taped with 2" self-adhering mesh-reinforced polypropylene except under floor slabs.
- E. Vapor retarder coating for use on exterior wall surfaces: Sprayed, elastomeric, UV-resistant coating capable of being applied to damp masonry and green concrete without adverse effect on adhesion; complying with requirements of ASTM C 836 except for minimum film thickness.
 - 1. Film Thickness: 8 mils, minimum.
 - 2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E 96/E 96M.
 - 3. Adhesion: Not less than 350 pounds-force per square inch when tested in accordance with ASTM D4541.
 - 4. Resistance to Fungal Growth: Pass AATCC Test Method 30.
 - 5. VOC Content: Less than 600 g/L when tested in accordance with 40 CFR 59 Subpart D (EPA Method 24).
 - 6. Suitable for use on concrete, masonry, and gypsum sheathing.
 - 7. Products
 - a. Henry Company; www.henry.com; Air-Bloc 06WB.
 - b. W.R. Grace & Company; www.grace.com; Perm-A-Barrier Liquid.
 - c. Substitutions: refer to Section 016000.

2.4 WATER-RESISTIVE BARRIER MATERIALS (AIR- AND VAPOR- PERMEABLE)

- A. Asphalt Felt: ASTM D 226 Type I felt (No.15). [Not used.]

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
- C. Air Barriers: Install continuous air-tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- D. Vapor Retarders: Install continuous air-tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- E. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer but at least 6 inches.
 - 3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
 - 4. For applications specified to be air-tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
 - 5. Install water-resistive barrier over jamb flashings.
 - 6. Install air barrier and vapor retarder UNDER jamb flashings.
 - 7. Install head flashings under weather barrier.
 - 8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- F. Mechanically Fastened Sheets - Vapor Retarder On Interior:
 - 1. When insulation is to be installed in assembly, install vapor retarder over insulation.
 - 2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air-tight seal.
 - 3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.

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SECTION 072500 – WEATHER BARRIERS

4. Seal entire perimeter to structure, window and door frames, and other penetrations.
 5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air-tight seal.
- G. Coatings:
1. Prepare substrate in manner recommended by coating manufacturer; fill and tape joints in substrate and between dissimilar materials.
 2. Sprayed Coating: Install to thickness recommended by manufacturer.
 3. Use self-adhesive sheet flashing to seal to adjacent construction and to bridge joints.
- H. Openings and Penetrations in Exterior Weather Barriers:
1. Install self-adhesive flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with self-adhesive flashing at least 4 inches wide; do not seal sill flange.
 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using self-adhesive flashing at least 9 inches wide, covering entire depth of framing.
 4. At head of openings, install self-adhesive flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 6. Service and Other Penetrations: Form self-adhesive flashing around penetrating item and seal to weather barrier surface.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Install air and vapor seal materials and assemblies in conjunction with materials described in other sections to provide continuous sealed barrier in the exterior enclosure of the building.
- C. Sheet Seal:
- D. Over exterior surface of sheathing install sheet seal Type 1 with manufacturer's preferred attachment. Seal laps with tape.

END OF SECTION

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Aluminum-faced composite panels with mounting system. Panel mounting system including integral parapet coping, anchorages, furring, fasteners, gaskets and sealants, related flashing adapters and masking for a complete installation.
- B. Shop-installed aluminum stiffeners on all panels of 20 square feet or larger, with one stiffener for each 20 sq. ft. of panel area.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Sheathing.
- B. 072500 – Weather Barriers.
- C. 076200 – Flashing and Sheet Metal Trim.
- D. 079200 – Joint Sealants.
- E. 075400 – Thermoplastic Membrane Roofing.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. E330: Structural Performance of Exterior Windows, Curtain Walls and Doors under the Influence of Wind Loads; latest edition.
 - 2. D1781: Climbing Drum Peel Test for Adhesive Materials; latest edition.
 - 3. E84: Surface-Burning Characteristics of Building Materials; latest edition.
 - 4. D3363: Method for Film Hardness by Pencil Test; latest edition.
 - 5. D2794: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) ; latest edition.
 - 6. D3359: Methods for Measuring Adhesion by Tape Test; latest edition.
 - 7. D2247: Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; latest edition.
 - 8. B117: Method of Salt Spray (Fog) Testing; latest edition.
 - 9. D822: Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer and Related Products; latest edition.
 - 10. D1308: Effect of Household Chemicals on Clear and Pigmented Organic Finishes; latest edition.
 - 11. D1735: Method for Water Fog Testing of Organic Coatings; latest edition.
 - 12. D1929: Standard Test Method for Determining Ignition Temperature of Plastics; latest edition.
 - 13. D635: Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in Horizontal Position; latest edition.

1.4 SUBMITTALS

- A. Submittals shall be in conformance with section 013000.
- B. Samples
 - 1. Panel assembly: Two samples of each type of assembly, 304 mm (12") x 304 mm (12") minimum, including mitered outside corner joint and dry-seal panel joint.
 - 2. Two samples of each color or finish selected, 76 mm (3") x 102 mm (4") minimum.
- C. Shop Drawings: Submit shop drawings showing project layout and elevations; fastening and anchoring methods relative to the building structure and adjacent finishes; detail and location of joints, sealants and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; stiffeners; and accessories.
- D. Manufacturer's certification that material meets specifications.
- E. Test reports as required to indicate building code compliance.

SECTION 074243 – ALUMINUM COMPOSITE MATERIAL BUILDING PANELS

1.5 QUALITY ASSURANCE

- A. Manufacturer qualifications: minimum of 15 years' architectural experience in the manufacture of this product.
- B. Fabrication and installation of composite panels shall be from a single source.
- C. Fabricator and installer qualifications
 - 1. Minimum 5 years' experience in architectural metal panel work similar in scope and size to this project.
 - 2. Approved for this type of work by the composite panel manufacturer.
- D. Coordinate fabrication schedule with construction progress as directed by the contractor to avoid delay of work.
- E. Maximum deviation from vertical and horizontal alignment of erected panels: 6 mm (1/4") in 6 m (20') non-accumulative.
- F. Panel fabricator / installer shall assume undivided responsibility for all components of the exterior panel system, including but not limited to, attachment to sub-construction, panel-to-panel joinery, panel-to-dissimilar-material joinery and joint seal associated with the panel system.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's recommendations.
- B. Store material in accordance with panel manufacturer's recommendations.

1.7 WARRANTY

- A. Fabricator / Installer: 1 year against fabrication and installation defects.
- B. The aluminum composite material : manufacturer's 20 years against Max 5 fade based on ASTM D2244 and Max 8 chalk based on ASTM D4212 and delamination of the paint finish

1.8 COORDINATION SCHEDULING

- A. Install flashings, copings and sealant immediately after installation of the system and when coatings are dry

PART 2 - PRODUCTS**2.1 COMPOSITE PANELS**

- A. Manufacturer, products
 - 1. Alcoa Architectural Products; www.alcoa.com; Reynobond ACM.
 - 2. Substitutions: refer to section 016000.
- B. Panel characteristics and performance
 - 1. Fire Resistive Core (FR).
 - 2. Panel Thickness: 0.157"
 - 3. Panel Weight: 1.53 lbs/sq.ft.
 - 4. Standard testing compliance
 - a. Bond integrity: ASTM D1781, pass.
 - b. Peel strength per ASTM D1781: 22.5 in.lb. / in. as manufactured, 22.5 in.lb. / in. after 21-day soak test.
 - c. Fire Performance: Class A per ASTM E84.
- C. Panel Finishes
 - 1. Finish colors
 - a. As indicated in the drawings.
 - b. Substitutions: not permitted.
 - c. Joint sealants to match panel finish color.
 - 2. Finish characteristics and performance: Primary base coating shall be factory applied on a continuous-process paint line.
 - a. Pencil hardness: ASTM D3363: F minimum.

SECTION 074243 – ALUMINUM COMPOSITE MATERIAL BUILDING PANELS

- b. Flexibility T-Bend: ASTM D4145: 0T.
- c. Adhesion: ASTM D3359: No adhesion loss.
- d. Reverse Impact: ASTM D2794: No cracking or paint removal.
- e. Salt Spray Resistance: ASTM B117: Pass 3,000 hrs.
- f. Humidity Resistance: ASTM D2247: Pass 3,000 hrs.
- g. Exterior Exposure: 10 years at 45°, South Florida. ASTM D2244 shall be Max. 5 fade and ASTM D4214 shall be Max. 8 chalk.
- h. Gloss: ASTM D523 standard at 60° ranges from 20% to >80%
- i. (FEVE) Megaflon®, Coraflon®, Valflon®, Lumiflon® or any polyester-based paint systems are not acceptable.
- 3. Finish warranty for film integrity, chalk resistance, color change and gloss retention:
 - a. 'Chase Blue': 10 years
 - b. 'Chase Nickel': 20 years

2.2 PANEL SYSTEM FABRICATION

- A. System Type
 - 1. Wet Seal System
 - 2. Provide an engineered pressure relief system including extruded perimeter frame; drainage gutter; all extrusions, clips, fasteners, anchors, spacers, trim, flashings, gaskets, backer rod and sealant, etc.
- B. System characteristics and tolerances
 - 1. System shall not have exposed fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
 - 2. Fabricate panel system to dimension, size and profile indicated on the drawings based on a design temperature of 68°F (20°C).
 - 3. Fabricate panel system to avoid compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature changes and at all times remain air- and watertight.
 - 4. The finish side of the panel shall have a removable protective film applied prior to fabrication, which shall remain on the panel during fabrication, shipping and erection to protect the surface from damage.
 - 5. Panel bow shall not exceed 0.8% of panel overall dimension in width or length.
 - 6. All fabrication shall be performed under controlled shop conditions when possible. Panel dimensions shall be such that there will be an allowance for field adjustment and thermal movement.
 - 7. Breaks and curves shall be sharp and true, and surfaces free of warps or buckles.
 - 8. Panels shall be visually flat.
 - 9. Panel Surfaces shall be free of scratches or marks caused during fabrication.
- C. System Performance
 - 1. System shall withstand building movements and weather exposures based on ASTM E330.
 - a. System shall be designed to withstand the design wind load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels.
 - b. Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed L/175 or 3/4", whichever is less.
 - c. Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.
 - d. Maximum anchor deflection shall not exceed 1/16". At 1 1/2 times design pressure, permanent deflections of framing members shall not exceed 1/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16".
 - e. System shall drain any water leakage occurring at the joints.

2.3 ACCESSORIES

- A. Extrusions, formed members, sheet and plate shall conform with ASTM B209 and the recommendations of the manufacturer.

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SECTION 074243 – ALUMINUM COMPOSITE MATERIAL BUILDING PANELS

- B. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
- C. Fasteners
 - 1. Fasteners shall be concealed.
 - 2. Fastener materials shall be compatible with the panel framing system and waterproofing system.
 - 3. Use fasteners sufficient length to penetrate the wood framing / blocking.
 - 4. Select fastener finish that will not cause galvanic reaction with adjacent metal materials.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
- B. Surfaces to receive panels shall be structurally sound. In no case shall metal structural supports be less than 16 gauge.

3.2 INSTALLATION

- A. Erect panels plumb and level. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
- B. Fabrication, assembly and erection procedure shall account for the ambient temperature at the time of the respective operation.
- C. Panels shall be erected in accordance with an approved set of shop drawings.
- D. All fasteners shall be concealed from view. All joints are to be sealed at the main panel face.
- E. Do not install component parts that are observed to be defective, including warped, bowed, dented, scraped and broken members.
- F. Do not cut, trim, weld or scrape component parts during erection in a manner that would damage the finish, decrease strength or result in a visual imperfection or a failure in performance. Return component parts that require alteration to shop for refabrication, or for replacement with new parts.
- G. Separate dissimilar metals; use appropriate gaskets and fasteners to minimize corrosive or electrolytic action between metals.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace panels damaged beyond repair as a direct result of panel installation. After installation, panel repair and replacement shall become the responsibility of the general contractor.
- B. Repair panels with minor damage.
- C. Remove masking film (if used) as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation shall become the responsibility of the general contractor.
- D. Any additional protection, after installation, shall be the responsibility of the general contractor to remove.
- E. Final cleaning shall not be part of the work of this section.

END OF SECTION

SECTION 07 48 00
RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM)

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide a thermally broken, rainscreen attachment system for attachment of exterior cladding installed over continuous exterior-insulation.
- B. Related Sections:
 - 1. Refer to Division 05 Section 054000 Cold Formed Metal Framing.
 - 2. Refer to Division 06 Section 061000 Rough Carpentry for wood framing.
 - 3. Refer to Division 06 Section 061643 Sheathing.
 - 4. Refer to Division 07 Section 072500 Weather Barriers.
 - 5. Refer to Division 07 Section 072113 Board Insulation for exterior continuous insulation.

1.2 SYSTEM DESCRIPTION

- A. System assembly shall include the following components from the substrate out:
 - 1. Substrate: Wall framing assembly and sheathing.
 - 2. Weather Resistant/Air Barrier over substrate.
 - 3. Continuous insulation.
 - 4. Thermally broken rainscreen attachment system.
 - 5. Exterior cladding.
- B. Design Requirements:
 - 1. Manufacturer is responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
 - 2. Employ registered professional engineer, licensed to practice engineering in jurisdiction where Project is located, to engineer each component of rainscreen attachment system.
 - 3. Structural Design: Exterior-insulated rainscreen wall assembly capable of withstanding effects of load and stresses from dead loads, wind loads, ice loads (if applicable) as indicated on Structural General Notes on Structural Drawings, and normal thermal movement without evidence of permanent defects of assemblies or components.
 - a. Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum ambient temperatures by preventing overstressing of components and other detrimental effects:
 - 1) Temperature Change (range): 120 degrees Fahrenheit (67 degrees C), ambient:
 - 4. Support Framing/Attachment System:
 - a. No framing component may penetrate the layer of continuous exterior insulation other than thermally isolated fasteners.
 - b. Frequency and spacing of stiffened horizontal girts as indicated by manufacture in project specific engineering package.
- C. Performance Requirements:

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1. Rainscreen Attachment System Performance: Comply with ANSI/ASHRAE 90.1-2010 definition of continuous insulation (c.i.).
2. No thermal bridges other than fasteners and service openings.
3. Thermal Performance:
 - a. Full constructed assembly must have a minimum 95% EFFECTIVE R-value when compared to the exterior continuous insulations rated R-Value.
 - b. Continuous framing profiles (including C- or Z-shaped sections or furring) penetrating insulation not allowed.
 - c. Perform effective R-Value calculation or modeling in accordance with ASHRAE guidelines.
 - d. Wall Assembly effective R-Value (U-Factor): See Construction Documents.
4. Structural Performance:
 - a. Wind Load Performance – Attachment system must show the following results when tested in accordance with ASTM E330-02.
 - 1) 90 pound per square foot negative and positive pressure held for 60 seconds, system components shall not experience failure or gross permanent distortion.
 - 2) 135 pound per square foot negative and positive pressure held for 10 seconds, system components shall not experience failure or gross permanent distortion.
 - b. Wind cycling (air pressure cycling) performance – Attachment system must show conformance to the following results when tested in accordance with ASTM E1886-05.
 - 1) A total of 4,500 air pressure cycles. Cycles must include 50 cycles at a maximum pressure of 90 pounds both positive and negative. Average cycle time must not be less than 3.25 seconds for both negative and positive cycles. Cladding weight supported during test must be a minimum of 11.5 pounds per square foot. No damage or deformation must be seen at end of test.
 - c. Gravity load (dead load) performance – Attachment system must demonstrate resistance to deflection under shear loading, applied parallel to the wall assembly and directly to the attachment system. Testing must be conducted using calibrated equipment by an IAS accredited third party laboratory. Deflection not to exceed 0.050 inches at 150 pounds per square foot.
5. Framing Members:
 - a. Test framing components to AAMA TIR- A8-[04] – Section 7.2 to determine structural performance and effective moment of inertia for each perforated component. Minimum Effective Moment of Inertia: 0.0066 in⁴.
 - b. Localized bending stress for eccentrically loaded framing members must be evaluated with the maximum effective length of resisting element not more than 12 inches.
6. Fasteners:
 - a. Minimum Safety Factor of 3 for both tension and shear values
 - b. Combined tension and shear shall be evaluated according to an interaction formula. Sum of terms shall not exceed 1.0.

1.3 SUBMITTALS

**RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM)
KNIGHT WALL SYSTEMS – 1.855.KWS.WALL**

- A. Product Data: Submit manufacturer's product literature and descriptions of testing performed on system components to indicate meeting or exceeding specified performance.
- B. Shop Drawings:
 - 1. Submit connection details to the cladding manufacturer, showing interface of rainscreen attachment system to substrate and panels with adjacent construction, signed and sealed by Professional Engineer.
 - 2. Show system installation and attachment, including fastener size and spacing.
- C. Structural Calculations:
 - 1. Submit rainscreen attachment manufacturer's comprehensive Structural Design analysis signed and sealed by a Professional Engineer.
- D. Samples: Submit following material samples for verification:
 - 1. Vertical Girts: Two (2) 12-inch long samples.
- E. Test Reports:
 - 1. Test to the following standards and provide written test reports by a third party:
 - a. AAMA TIR-A8-[04]: Structural Performance of Composite Thermal Barrier Framing Systems – Section 7.2
 - b. ASTM E330
 - c. ASTM E1233
 - d. Gravity load test report, performed by IAS accredited third party
 - 2. Comprehensive three-dimensional thermal modeling report indicating framing systems impact on exterior insulation rated R-value.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Minimum 5 years' experience specializing in the manufacturing of façade attachment/support framing similar to those specified.
 - 2. Ability to demonstrate conformance to testing requirements.
- B. Installer Qualifications:
 - 1. Minimum of 3 years' documented experience or minimum of 5 completed projects of equivalent scope and quality and recommended by manufacturer to perform work of this Section.
 - 2. Onsite superintendent or foreman overseeing installation on site during entire work of this Section with experience equivalent to installer and in good standing with the manufacturer.
- C. Engineer Qualifications: Registered professional engineer experienced in the design of curtain wall systems, anchors, fasteners and licensed to practice engineering in the jurisdiction where Project is located.
- D. Pre-Installation Meeting:
 - 1. Discuss sequence and scheduling of work and interface with other trades.
 - 2. Review metal wall framing assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
 - 3. Review and document methods, procedures and manufacturer's installation guidelines and safety procedures for exterior wall assembly.

**RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM)
KNIGHT WALL SYSTEMS – 1.855.KWS.WALL**

1.5 QUALITY CONTROL

- A. Single source responsibility:
 - 1. Furnish engineered rainscreen attachment system components under direct responsibility of single manufacturer.
- B. Field Measurements: Verify actual supporting and adjoining construction before fabrication.
- C. Record field measurements on project record shop drawings.
- D. Established Dimensions: Where field measurements cannot be made without delaying work, guarantee dimensions and proceed with fabrication of rainscreen attachment system corresponding to established dimensions.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials and components in manufacturers' original, unopened and undamaged containers or bundles, fully identified. Exercise care to avoid damage during unloading, storing and installation.
- B. Store, protect and handle materials and components in accordance with manufacturer recommendations to prevent damage, contamination and deterioration. Keep materials clean, dry, and free of dirt and other foreign matter, and protect from damage due to weather or construction activities.

1.7 SEQUENCING

- A. Ordering: Comply with manufacturers' ordering instructions and lead time requirements to avoid construction delays.
- B. Coordinate construction to ensure that assemblies fit properly to supporting and adjoining construction; coordinate schedule with construction in progress to avoid delaying work.

1.8 WARRANTY

- A. Manufacturer Warranties:
 - 1. Attachment System: Ten (10) year Limited Warranty.
 - a. Covers components of the attachment system, including structural failure of components when all the materials and components are supplied and installed per manufacturer's requirements.
 - b. Includes labor and material for removal and replacement of defective material.
 - c. Includes labor to remove and reinstall façade finish panels, finish closures and façade finish accessories necessary to access defective material.
- B. Contractor's Warranties: 2-year labor warranty, to cover repair of materials found to be defective as a result of installation errors.
- C. Limitation of Warranties: Exclude repairs, replacement, and corrective work to the substrate, primary structure, finish panels, and/or property – unless otherwise noted above. Warranties exclude mechanical damage due to abuse, neglect, primary structure failure, or forces of nature greater than normal weather conditions.

1.9 MAINTENANCE

**RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM)
KNIGHT WALL SYSTEMS – 1.855.KWS.WALL**

- A. Extra Materials: For use by Owner in building maintenance and repair, provide 3 percent additional rainscreen attachment components in new, unopened cartons, packaged with protective covering for storage and identified with appropriate labels.

PART 2 - PRODUCTS

2.1 RIGID INSULATION

- A. Thermax CI, The Dow Chemical Company.

2.2 RAINSCREEN ATTACHMENT/SUPPORT FRAMING SYSTEM

- A. Comply with ANSI/ASHRAE 90.1-2010 definition of continuous insulation (c.i.).
- B. Coating Material: ASTM A1046, Zinc-Aluminum-Magnesium, minimum thickness ZM40.
 - 1. ASTM A653 Galvanized steel is not acceptable.
- C. Steel Classification: Structural Steel (SS), Grade 50, 50 ksi Yield.
- D. Spacing: Comply with manufacturer's Professional Engineers calculations.
- E. Vertical Girt: Vertical girt with pre-punched attachment holes, directly attached on top of rigid insulation at regular spacing, with engineered thermally isolated washer assembly and fasteners.
 - 1. Steel Thickness: Minimum 0.046-inch thick (18 gauge).
 - 2. Profile Depth: 0.75 inches.
 - 3. Girt Fastening Face, Width: 2-inches.
 - 4. Finish: Painted black at open joint panel assemblies.
 - 5. Basis of Design: CI™ by Knight Wall Systems.
 - 6. Or approved equal.
- F. Secondary Horizontal Rail: Nominal 0.046 inch thick (18 gauge) [0.054-inch thick (16 gauge)] cold-formed steel.
 - 1. Profile: Hat channel with stiffening lips.
 - 2. Profile Depth: 0.75 inches.
 - 3. Girt Fastening Face: 2.0 inches [3.0 inches] [4.0 inches] [5.0 inches] [Manufacturer's recommendation as Engineered].
 - 4. Weep Drains: 0.75 inches diameter at 4 inches on center along flanges to allow for free air flow laterally.
 - 5. Attachment Holes: Locate at 2 inch on center along back to facilitate number 14 self-drilling self-tapping screw attachment to primary rail.
 - a. Oversize holes to allow for thermal contraction and expansion of rail.
 - 6. [Finish: Painted black at open joint panel assemblies.]
 - 7. Basis of Design: PanelRail™ by Knight Wall Systems.
 - 8. Or approved equal.
- G. Reveal Girt: Nominal 0.046 inch thick (18 gauge) [0.054-inch thick (16 gauge)] cold-formed steel.
 - 1. Profile: Square hat channel with stiffening lips.
 - 2. Depth: 0.75 inches.
 - 3. Dimensions: 2.0 inches at web, 1.625 inches at each flange with 0.25 stiffening lips.

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RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM) KNIGHT WALL SYSTEMS – 1.855.KWS.WALL

4. Attachment Holes: Locate at 8 inch on center along back to facilitate number 14 self-drilling self-tapping screw with thermal isolation washer attachment to primary rail.
 5. [Finish: Painted black at open joint panel assemblies.
 6. Basis of Design: RevealGirt™ by Knight Wall Systems.
 7. Or approved equal.]
- H. Fasteners:
1. Sufficient length to provide solid attachment through rigid insulation to structure as required by manufacturer.
 2. Thermal Isolating Washers: Minimum 0.125 inch thick Polyoxymethylene copolymer (POM) washers with integral centering lip to act as a thermal break between wall anchor fasteners and girt.
 - a. Tensile Yield Strength: 9.57 ksi per ISO 527
 - b. Melting Temperature: 329 degrees Fahrenheit per ISO 3146
 - c. Basis of Design: ThermaStop™ Isolator by Knight Wall Systems.
 - d. Or approved equal.
 3. Steel stud framing substrate: Self-drill hex-washer-head stainless steel with 1,000 hour salt-spray rated thermoset polyester coating.
 - a. Embedment depth: 0.625 inches or three full threads minimum, whichever is greater.
 - b. Minimum ultimate pull-out capacity from 18 gauge steel: 450 pounds.
- I. Accessories:
1. Galvanic Protection: Utilize tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

2.3 SIDING/CLADDING PANEL

- A. Refer to Division 07 for Cladding Systems

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with manufacturer requirements for installation conditions affecting performance of the work.
1. Do not proceed with installation until unsatisfactory conditions have been corrected.
 2. Ensure weather-resistant barrier (WRB) and rigid insulation is installed prior to installing rainscreen attachment system.
 3. Ensure fenestration, transitions, discontinuities, sills, and ledgers are flashed and sealed to move moisture to the exterior of the building.
- B. Field verify architectural details and mechanical and electrical requirements prior to commencing installation.
- C. Commencement of installation constitutes acceptance of existing conditions and acceptance of responsibility for satisfactory performance.

3.2 RAINSCREEN ATTACHMENT SYSTEM INSTALLATION

SECTION 07 48 00

RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM) KNIGHT WALL SYSTEMS – 1.855.KWS.WALL

- A. Preparation:
 - 1. Verify vertical girt does not cantilever past rigid insulation.
- B. Installation
 - 1. Install vertical girts in vertical orientation in strict accordance with manufacturer's installation instructions.
 - 2. Do not use shims to plumb the wall between the vertical girt and insulation.
 - 3. Minimum length of installed cut girt is 24-inches and shall be attached with at least two (2) fasteners.
 - 4. Mount box girts, fastened up to 32 inches on center (as determined by the manufacturer's engineering calculations) over installed rigid insulation, using one wall anchor per pre-punched attachment hole at spacing indicated on engineering calculations.
 - a. Check plumb of vertical girts both parallel and perpendicular to the structure.
 - b. Tighten screws that attach vertical girt through insulation to substructure to a snug tight condition and not stripped. Do not over-torque beyond manufacturer's recommendation. If installed using hand tools, verify for each installer at beginning of project using snug-tight criteria. Do not use stripped holes.
 - c. Where obstructions are present and unavoidable (i.e. window openings), use laser or chalk line to restart girt.
 - d. Locate vertical girt at jamb conditions and outside corner conditions.
 - e. Use shearing instruments (i.e. snips, nibbler, etc.) for cutting metal framing components. Saws are not recommended, as the sparks produced during cutting will damage the anti-corrosion coating. If sparks are generated during cutting, be sure the portion of the component to be installed on the building is protected from sparks and that any stockpile near the cutting station is also protected.
 - f. The systems components should not be cut while installed on the building, unless using a shearing instrument.
 - g. Replace thermal isolator pieces that break during installation.
 - h. Provide a 3/8" – 1/2" gap between girts for expansion when multiple lengths of vertical girts are installed.
 - 5. Attach secondary horizontal rails to vertical girts plumb, straight and square.
 - a. Tighten screws to a snug tight conditions and not stripped. Do not use stripped holes or screws.
 - b. Shims can be used between horizontal rail and vertical girt or cladding panel and horizontal rail (if approved by cladding manufacturer). Shims cannot be used between vertical girt and insulation.
 - c. Both flanges/edges of stiffened horizontal rail must be attached to vertical girt.

3.3 SPRAY INSULATION

- A. Fully secure exterior insulation prior to spray foam (SPF) within stud cavity to prevent deformation of exterior insulation due to expansion of SPF.

3.4 SIDING/CLADDING PANEL INSTALLATION

- A. The cavity must be clear and free from air flow and drainage obstructions.

SECTION 07 48 00

**RAINSCREEN ATTACHMENT SYSTEM (CI™ SYSTEM)
KNIGHT WALL SYSTEMS – 1.855.KWS.WALL**

END OF SECTION 07 48 00

CHASE
SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Adhered thermoplastic polyolefin (TPO) membrane roofing system.
- B. Roof insulation, flat and tapered.
- C. Roof decking and sheathing.
- D. Roofing material flashing and boots.
- E. Roofing system walkway pads, adhesives, tapes and other accessories and materials.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry.
- B. 074243 – Aluminum Composite Material Building Panels.
- C. 076200 – Flashing and Sheet Metal Trim.
- D. 077200 – Roof Accessories.
- E. Division 22 – Plumbing: Roof drains.
- F. Division 23 – Heating, Ventilation and Air Conditioning

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C1278 - Standard Specification for Fiber Reinforced Gypsum Panel, latest edition.
 - 2. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing, latest edition.
 - 3. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, latest edition.
 - 4. ASTM D6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing, latest edition.
- B. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation, latest edition.
- C. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; latest edition, with interim updates.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, sheathing, insulation, surfacing, and fasteners.
- C. Samples for Verification: Submit two samples 12 x 12 inches in size illustrating insulation.
- D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section:
 - 1. Approved by membrane manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

CHASE
SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

- B. Store products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.

1.7 WARRANTY

- A. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.

PART 2 - PRODUCTS

2.1 ROOFING MEMBRANE

- A. Sheet material: Thermoplastic Polyolefin (TPO) single-ply white membrane with internal fabric reinforcing, 60-mil thickness minimum, factory-fabricated into largest sheets possible, complying with ASTM D6878.
- B. Seaming material: as recommended by the sheet material manufacturer.
- C. Flexible flashing material: same material as sheet material membrane.
- D. Manufacturers
 - 1. Carlisle SynTec: www.carlisle-syntec.com.
 - 2. Firestone Building Products Co.: www.firestonebpco.com.
 - 3. GAF, www.gaf.com.
 - 4. Substitutions: refer to section 016000.

2.2 ROOF SHEATHING

- A. Panels: 1/4" or 1/2" impact-resistant nonstructural fiber-reinforced gypsum panels compliant with ASTM C1278 or C1177.
- B. Joint tape: paper tape, 1 1/2" wide, self-adhering, as recommended by the panel manufacturer.
- C. Fasteners as recommended by the panel manufacturer for the application and substrate, and compatible with the roofing insulation.
- D. Products
 - 1. Georgia-Pacific, www.gp.com, DensGlass.
 - 2. United States Gypsum Corp., www.usg.com, Securock.
 - 3. Substitutions: refer to section 016000.

2.3 ROOF DECKING

- A. Refer to Section 061000.

2.4 INSULATION

- A. Polyisocyanurate closed-cell rigid foam board insulation
 - 1. Product standard: ASTM C1289, Type II, Class I, Grade I.
 - 2. Facing: cellulose felt or glass fiber mat, both faces.
 - 3. Thermal resistance (R-Value): R-6.1 minimum, per inch thickness.
 - 4. Form: 4'-8' boards, flat and tapered, 1/2" minimum thickness.
 - 5. Manufacturers
 - a. Atlas Roofing Corporation: www.atlasroofing.com.
 - b. GAF Materials Corporation: www.gaf.com.
 - c. Dow Chemical Company: www.dow.com.
 - d. Owens Corning Corporation: www.owenscorning.com.
- B. Fasteners: appropriate for purpose intended and approved by roofing and insulation manufacturers. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.
- C. Adhesive: as recommended by the insulation manufacturer.

CHASE
SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

2.5 ACCESSORIES

- A. Stack boots and similar pipe, conduit and equipment support penetration flashing: roof membrane manufacturer's approved matching-material pre-fabricated multi-size portal-type flashing collar, with stainless steel ring clamp where applicable.
- B. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- C. Sealants: As recommended by membrane manufacturer.
- D. Walkway pads: Textured heat-weldable continuous TPO walkway rolls, 30"-34" wide x 50' long, as manufactured by the roofing membrane manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water in quantities greater than can be weatherproofed the same day.

3.2 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.3 WOOD DECK PREPARATION

- A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.

3.4 METAL DECK PREPARATION

- A. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.
 - 4. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual recommendations and roofing manufacturer's instructions.

3.5 INSULATION BOARD INSTALLATION

- A. Install insulation in accordance with Factory Mutual DS 1-28 for Class I and windstorm resistance of I-90.
- B. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- C. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- D. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.

CHASE

SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

- E. Do not apply more insulation than can be covered with membrane in same day.
- F. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
 - 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- G. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- H. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

3.6 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate of 1.66 gal/square. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by heat welding, minimum 1-1/2 inches. Seal permanently waterproof.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane up a minimum of 8 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.
- H. Install walkway pads. Space pad joints to permit drainage, and as indicated by roof membrane manufacturer.

3.7 FIELD QUALITY CONTROL

- A. Refer to Section 014000 for general requirements for field quality control and inspection.

3.8 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

3.9 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal building envelope drainage materials and assemblies, including but not limited to fascias, scuppers, reglets, drip edges and miscellaneous metal flashings and trims.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Wood blocking for batten seams.
- B. 072400 – Exterior Insulation and Finish System
- C. 072500 – Weather Barriers
- D. 072423 – Direct-Applied Exterior Finish system
- E. 075400 – Thermoplastic Membrane Roofing
- F. 076526 – Self-Adhering Sheet Flashing
- G. 077113 - Manufactured Copings
- H. 077123 – Downspouts.
- I. 077200 – Roof Accessories
- J. 079200 – Joint Sealants
- K. 081113 – Hollow Metal Doors and Frames
- L. 084113 – Aluminum-Framed Entrances and Storefronts
- M. 084413 – Glazed Aluminum Curtain Walls
- N. 092423 – Portland Cement Stucco

1.3 REFERENCES

- A. American Society for Testing and Materials International (ASTM)
 - 1. ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications, latest edition.
 - 2. ASTM A653/A653M, Steel Sheet Zinc-Coated (Galvanized) or Zinc-Alloy Coated (Galvanized) by the Hot-Dip Process, latest edition.
 - 3. ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, latest edition.
 - 4. ASTM A480, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip, latest edition.
 - 5. ASTM B32, Standard Specification for Solder Metal, latest edition.
 - 6. ASTM D 226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, latest edition.
 - 7. ASTM D478, Standard Specification for Zinc Yellow (Zinc Chromate) Pigments, latest edition.
 - 8. ASTM D1187, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal, latest edition.
 - 9. ASTM D4586, Standard Specification for Asphalt Roof Cement, Asbestos-Free, latest edition.
- B. American Architectural Manufacturers Association
 - 1. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum
 - 2. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; latest edition

1.4 SUBMITTALS

- A. Refer to Section 013000 for submittal procedures.
- B. Product Data: Catalog cuts and installation instructions for manufactured products, including metal flashing materials and associated sealants, adhesives, tapes, etc.
- C. Shop Drawings: For manufactured assemblies only- indicate materials, gages, profiles, jointing patterns, jointing details, fastening methods, and installation details.
 - 1. Through-wall scuppers
 - 2. Other manufactured assemblies
- D. Samples
 - 1. Samples representative of material gauge, finish and color of prefinished and mill finish flashing materials, three (3) for each of the included flashing and trim types

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Manufacturer qualifications: Company with manufacturing facilities, materials and products compliant with the referenced standards
- C. Fabricator and Installer Qualifications:
 - 1. Company specializing in sheet metal work with 3 years of experience.
 - 2. Knowledgeable in the proper use and handling of the materials specified.
 - 3. Materials of each type shall be provided and installed by a sole source. Where shop or field fabrication of custom types is required, the fabrication and installation shall be by a sole source.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver the products and materials in the manufacturers' original containers, dry and undamaged, seals and labels intact.
- B. Store products and materials in a weather-protected environment out of direct sunlight, between 32 and 90 deg. F, and clear of ground and moisture.
- C. All waterproof tarps shall be opaque.
- D. Do not double-stack pallets.

1.7 WARRANTY

- A. Provide manufacturer's standard written material warranty upon completion of the work.
- B. Provide installer's 1-year labor and materials warranty upon completion of the work.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Conform to the environmental requirements of Section 079200 – Joint Sealants where their use is required by this section.
- B. Conform to the environmental requirements of the bituminous paint, primer and touch-up paint manufacturers where their use is required by this section.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

- A. Pre-finished Aluminum
 - 1. Compliant with ASTM B209, Alloy 3003, Temper H14, 0.024" thick minimum.
 - 2. Metal flashing, fascia and drip edge materials at asphalt shingle and Aluminum metal panel roofing systems- refer to Section 073113 – Asphalt Shingle Roofing.
 - 3. Alternate metal flashing, fascia, drip edge and drainage control materials at Galvalume® metal panel roofing systems- refer to Section 076100 - Sheet Metal Roofing
 - 4. Through-wall scuppers and other field- or shop-fabricated sheet metal assemblies.

5. As indicated elsewhere in drawings.
6. Finish: Factory-applied min. 70% Kynar 500 ® fluoropolymer coating
 - a. Compliant with AAMA 620.
- B. Galvanized Steel
 1. Compliant with ASTM A653, Grade A, G90 Zinc coating, 26 gauge minimum.
 2. Finish: Factory-applied min. 70% Kynar 500 ® fluoropolymer coating
 - a. Compliant with AAMA 621.
- C. Stainless Steel Drip Edge
 1. Compliant with ASTM A240, Type 316, 26 gauge minimum.
 2. Applied at rubberized asphalt flashing terminations- refer to Section 076526 – Self-Adhering Sheet Flashing.
 3. As indicated elsewhere in drawings.
 4. Edge detail: 3/8" 45-degree drip with 3/16" closed hem.
 5. Finish: ASTM A480 Type 2D

2.2 ACCESSORIES

- A. Solder: Compliant with ASTM B32, flux type and alloy composition as required for use with the metals to be soldered.
- B. Underlayment: Compliant with ASTM D 226, organic roofing felt
- C. Mechanical fasteners
 1. Install nails, rivets, expansion anchors, screws, etc. of materials as recommended by the flashing manufacturer and compatible with the roofing material and substrate without galvanic corrosion.
 - a. Where not otherwise indicated, provide stainless steel fasteners at Aluminum materials.
 - b. Where not otherwise indicated, provide stainless steel fasteners at stainless steel materials.
 - c. Where not otherwise indicated, provide stainless steel or galvanized steel fasteners at galvanized steel materials.
 2. Fastener lengths shall be as required to penetrate the substrate fully and secure the materials for their anticipated service life.
- D. Sealants: Refer to Section 079200 – Joint Sealants.
- E. Primer and touch-up paint: as provided or indicated by the flashing finish system manufacturer.
- F. Wall cavity weep materials: refer to Section 042000 – Unit Masonry.
- G. Isolating materials
 1. ASTM D1187 Type I bituminous paint.
 2. ASTM D478 Zinc chromate primer, followed by two coats finish paint.
- H. Plastic Cement: ASTM D4586, Type I.
- I. Cavity support blocking: wood-preserved-treated dimension lumber or structural-use panel material- refer to Section 061000 – Rough Carpentry.

2.3 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch unless otherwise noted.
- D. Apply sealants in accordance with Section 079200 – Joint Sealants.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed, lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18-inch-long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

CHASE
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates as required to provide surfaces that are smooth, sound, clean, dry and free from defects that might affect flashing performance.
- B. Remove or modify projections which would puncture the materials or form surfaces which would collect water.
- C. Coordinate with masons for the application of mortar skim coat to masonry surfaces where required for proper flashing attachment.
- D. Coordinate with roofers for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
- E. Install starter and edge strips, and cleats before starting installation.

3.2 INSTALLATION

- A. Install sheet metal flashing and trim in accordance with the SMACNA Architectural Sheet Metal Manual.
- B. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water-tight installation.
- C. Apply bituminous paint between dissimilar materials where required to prevent galvanic reaction and corrosion.
- D. Miter and seam corners of flashing assemblies.
- E. Conform to drawing details.
- F. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- G. Apply plastic cement compound between metal flashings and felt or membrane flashings.
- H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- I. Seal metal joints watertight.
- J. Remove adhered protective plastic coverings from metal materials immediately after installation.

3.3 CLEANING

- A. Where adjacent finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning requirements and conform to their documented instructions.
- B. Remove all debris, tools and equipment from the project site after completion of the work.

END OF SECTION

CHASE
SECTION 076526 – SELF-ADHERING SHEET FLASHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Flexible rubberized asphalt self-sealing through-wall and applied membrane flashing, drip edge and accessory materials.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Wood blocking for batten seams.
- B. 072400 – Exterior Insulation and Finish System
- C. 072500 – Weather Barriers
- D. 075400 – Thermoplastic Membrane Roofing
- E. 076526 – Self-Adhering Sheet Flashing
- F. 077100 – Roof Specialties
- G. 077113 – Manufactured Copings
- H. 077200 – Roof Accessories
- I. 079200 – Joint Sealants
- J. 084113 – Aluminum-Framed Entrances and Storefronts
- K. 084400 – Curtain Wall and Glazed Assemblies
- L. 092423 – Portland Cement Stucco

1.3 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM D412 – Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension, latest edition.
 - 2. ASTM D903 – Standard Test Method for Peel or Stripping Strength of Adhesive Bonds, latest edition.
 - 3. ASTM D1876 – Test Method for Peel Resistance of Adhesives, latest edition.
 - 4. ASTM D1970 – Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection, latest edition.
 - 5. ASTM E96 – Test Methods for Water Vapor Transmission of Materials, latest edition.
 - 6. ASTM E154 – Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover, latest edition.

1.4 SUBMITTALS

- A. Product Data and Shop Drawings: Submit for each product; Spec-Data®/Data Sheets, details and installation procedures.
- B. Test Reports: Indicating compliance with the performance requirements of this section.
- C. Samples of flashing, two of each type.
- D. Refer to Section 013000 for submittal procedures.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Manufacturer qualifications: Company with manufacturing facilities, materials and products compliant with the referenced standards
- C. Fabricator and Installer Qualifications:
 - 1. Company specializing in sheet metal work with 3 years of experience.
 - 2. Knowledgeable in the proper use and handling of the materials specified.

3. Materials of each type shall be provided and installed by a sole source. Where shop or field fabrication of custom types is required, the fabrication and installation shall be by a sole source.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver the products and materials in the manufacturers' original containers, dry and undamaged, seals and labels intact.
- B. Store products and materials in a weather-protected environment out of direct sunlight, between 32 and 90 deg. F, and clear of ground and moisture.
- C. All waterproof tarps shall be opaque.
- D. Do not double-stack pallets.

1.7 WARRANTY

- A. Submit manufacturer's warranty that flashing and accessories are free of defects at time of delivery, and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Warranty Period: Five years from date of completion of the flashing installation.
- C. Installer to warrant that flashing and accessories have been installed in accordance with manufacturer's recommendations.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Conform to the environmental requirements of Section 079200 – Joint Sealants where their use is required by this section.
- B. Conform to the environmental requirements of the bituminous paint, primer and touch-up paint manufacturers where their use is required by this section.

PART 2 - PRODUCTS

2.1 SHEET MATERIAL

- A. Self-adhesive rubberized asphalt bonded high-density polyethylene to form a min. 40-mil thick waterproof membrane, with interleaved disposable silicone-coated release backing paper.
 1. Performance Requirements
 - a. Water vapor transmission, ASTM E96, Method B: 0.05 perms maximum
 - b. Lap adhesion
 - 1) ASTM D1876: 5.0 lbs/in. of width minimum
 - 2) ASTM D903: 10 lbf/in minimum
 - c. Low-temperature flexibility, ASTM D1970: unaffected to -10°F
 - d. Tensile strength: ASTM D412, Die C Modified: 750 psi minimum
 - e. Elongation: ASTM D412, Die C – Min. 200%
 2. Manufacturers, products
 - a. W.R. Grace, Perm-A-Barrier
 - b. Tamko, TW Thru Wall Flashing
 - c. W.R. Meadows, Air-Shield
 - d. Substitutions: refer to Section 016000.

2.2 DRIP EDGE

- A. Required at all rubberized asphalt flashing material terminations exposed to sunlight.
- B. Refer to Section 076200 – Flashing and Sheet Metal Trim.

2.3 ACCESSORIES

- A. Primer / surface conditioner: water- or solvent-based adhesive as recommended by membrane manufacturer to impart an aggressive, high-tack finish on the treated substrate.
- B. Termination mastic: rubberized asphalt-based mastic as recommended by the membrane manufacturer for sealing penetrations and terminations of membrane.

CHASE
SECTION 076526 – SELF-ADHERING SHEET FLASHING

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine surfaces to receive membrane. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.
- B. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of flashing. Remove all deleterious materials from surfaces to be flashed.
- C. Protect adjacent surfaces not designated to receive self-adhering flashing membrane.
- D. Clean and prepare surfaces to receive membrane in accordance with manufacturer's instructions.
- E. Do not apply membrane to surfaces unacceptable to manufacturer.
- F. All surfaces must be clean, smooth, and dry and must be clean of oil, dust, and excess mortar.
- G. Strike masonry joints flush.
- H. Patch all holes and voids and smooth out any surface misalignments.
- I. Concrete surfaces must be cured for a minimum of 14 days.
- J. If curing compounds are used, they must be clear, resin-based, and without oil, wax, or pigments.
- K. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply primer / surface conditioner by air spray, brush or roller. Allow the primer to dry completely before flashing application.

3.2 INSTALLATION

- A. Precut pieces of flashing to easily handled lengths for each location.
- B. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
- C. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
- D. Overlap adjacent pieces and drip edge 2 in. and roll all seams with a steel hand roller.
- E. Trim bottom edge 1/2" back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
- F. At heads, sills and all flashing terminations turn up ends a minimum of 2 in. and make careful folds to form an end dam, with the seams sealed.
- G. Seal top edge of transition membrane with pointing mastic.
- H. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

3.3 PROTECTION

- A. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.

3.4 CLEANING

- A. Where adjacent finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning requirements and conform to their documented instructions.
- B. Remove all debris, tools and equipment from the project site after completion of the work.

END OF SECTION

CHASE
SECTION 077113 – MANUFACTURED COPINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Factory-fabricated and finished sheet metal parapet copings and associated hardware and accessories.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry.
- B. 072400 – Exterior Insulation and Finish Systems.
- C. 072423 – Direct-Applied Exterior Finish System.
- D. 072500 – Weather Barriers.
- E. 075400 – Thermoplastic Membrane Roofing.
- F. 076526 – Self-Adhering Sheet Flashing.
- G. 079200 – Joint Sealants
- H. 092423 – Portland Cement Stucco

1.3 REFERENCES

- A. American Society for Testing and Materials
 - 1. ASTM A653/A653M, Steel Sheet Zinc-Coated (Galvanized) or Zinc-Alloy Coated (Galvanealed) by the Hot-Dip Process, latest edition.
 - 2. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy- Coated by the Hot-Dip Process, latest edition.
 - 3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, latest edition.
 - 4. ASTM E283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - 5. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference, latest edition.
 - 6. ASTM E1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference, latest edition.
 - 7. ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference, latest edition.
 - 8. ASTM E1680 Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems, latest edition.
- B. American Architectural Manufacturers Association
 - 1. AAMA 620 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum
 - 2. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; latest edition
- D. Underwriters Laboratories, Inc. (UL)
 - 1. UL 263: Fire Tests of Building Construction and Materials, latest edition.
 - 2. UL 580 Standard for Tests for Uplift Resistance of Roof Assemblies, latest edition.
 - 3. UL 790 Standard Test Methods for Fire Tests of Roof Coverings, latest edition.
 - 4. UL 1897 Uplift Tests for Roof Covering Systems, latest edition.
 - 5. UL 2218 Standard for Impact Resistance of Prepared Roof Covering Materials, latest edition.

1.4 SUBMITTALS

- A. Submit detailed drawings showing anchoring, joint and termination details.
- B. Product data: sheet metal, sealants and fasteners.

CHASE
SECTION 077113 – MANUFACTURED COPINGS

- C. Submit two full-size coping system assembly samples, including factory finish as specified, one butt joint with splice plates and sealant tape, secured to a substrate by the specified anchoring clip system.
- D. Submit Statements of compliance with minimum requirements of the following performance tests:
 - 1. Structural performance: ASTM E1592; meets performance requirements identified by applicable building codes for the designed loading conditions.
 - 2. Air infiltration: ASTM E1680; maximum static air infiltration of 0,01 cfm at 6.24 psf pressure differential.
 - 3. Water infiltration: ASTM E1646; no water penetration at minimum 12.0 psf.
 - 4. Impact resistance: UL 2218; Class 4, no openings.
 - 5. Wind Uplift: UL 580; Class [90/105/120] or similar test-agency certification as required by code.
 - 6. Combustibility: UL 790.
- E. Calculations with registered engineer seal, verifying roof panel and attachment method resists wind pressures imposed on it pursuant to applicable building codes.
- F. Warranty documents complying with finish, weather-tightness and corrosion requirements.
- G. Jurisdictional approvals as applicable. In jurisdictions where required, materials shall carry applied labels indicating compliance with the required codes.

1.5 QUALITY ASSURANCE

- A. All materials of this Section shall be provided by a single manufacturer, including installation accessories and hardware.
- B. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- C. Manufacturer qualifications: Company with manufacturing facilities, materials and products compliant with the referenced standards.
- D. Fabricator and Installer Qualifications:
 - 1. Company specializing in sheet metal work with 3 years of experience.
 - 2. Knowledgeable in the proper use and handling of the materials specified.
 - 3. Materials of each type shall be provided and installed by a sole source. Where shop or field fabrication of custom types is required, the fabrication and installation shall be by a sole source.
- E. Provide mock-up for evaluation of surface preparation techniques and application workmanship. Do not proceed with remaining work until workmanship, color and sheen are approved by Architect of Record.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver the products and materials in the manufacturers' original containers, dry and undamaged, seals and labels intact.
- B. Store products and materials in a weather-protected environment out of direct sunlight, clear of ground and moisture.
- C. Do not double-stack pallets.

1.7 SEQUENCING

- A. Ensure that products of this section and information required for installation of products of this section is furnished to affected trades in time to prevent interruption of construction progress.
- B. Coordinate installation with roof membrane manufacturer's instructions.

1.8 PROJECT CONDITIONS

- A. Perform work only when environmental conditions (temperature and humidity) are within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions beyond manufacturer's absolute limits.

CHASE
SECTION 077113 – MANUFACTURED COPINGS

1.9 WARRANTY

- A. Provide manufacturer's standard written material warranty upon completion of the work.
- B. Provide a 20-year warranty for manufacturer's factory-applied finish against color fade, chalk and film integrity.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

- A. Pre-finished Aluminum-Zinc alloy-coated (hot-dip galvanized) steel sheet
 - 1. United States Steel Corporation Galvalume® 22-gauge minimum cold-rolled steel sheet with aluminum-zinc alloy coating with chromate pretreatment, manufactured in accordance with ASTM A792.
 - 2. Factory-applied min. 70% Kynar 500® or Hylar 5000® fluoropolymer coating
 - a. Compliant with AAMA 621.
 - b. Color(s) as indicated in the drawings.
- B. Pre-finished Aluminum sheet
 - 1. Manufactured in accordance with ASTM B209, 0.050" minimum thickness.
 - 2. Factory-applied min. 70% Kynar 500® or Hylar 5000® fluoropolymer coating
 - a. Compliant with AAMA 620.
 - b. Color(s) as indicated in the drawings.

2.2 COPING SYSTEM MANUFACTURERS AND PRODUCTS

- A. Petersen Aluminum / Pac-Clad; www.pac-clad.com; Pac-Continuous Cleat Coping.
- B. Substitutions: refer to Section 016000.

2.3 ACCESSORIES

- A. Concealed-fastener continuous cleats
 - 1. Installed in non-continuous sections or modified with punched holes where required for ventilation of parapet cavity.
 - 2. Installed continuous at splices, corners and ends.
- B. Shop- or factory-fabricated splice plates, color-matched to coping finish.
- C. Adhesive neoprene splice plate strips.
- D. Sealants: provided as required by installer, compatible with materials and finishes in contact and meeting the requirements of the coping system manufacturer's material warranty. Refer to Section 079200 – Joint Sealants.
- E. Mechanical fasteners
- F. Factory-fabricated corner units, extenders and endcaps, in matching finish.
- G. Mechanical fasteners
 - a. As provided or recommended by the coping system manufacturer.
 - b. Compatible with the substrate being fastened to, including sheet and liquid membranes and sealants in contact. Select fastener material to eliminate the possibility of galvanic corrosion.
 - c. Fastener lengths as required to penetrate the substrate fully and secure the materials for their anticipated service life.
- H. Touch-up paint as provided by the coping system manufacturer.
- I. Wall cavity weep materials: refer to Section 042000 – Unit Masonry.
- J. Support blocking: wood-preserved-treated dimension lumber or structural-use panel material- refer to Section 061000 – Rough Carpentry.

CHASE
SECTION 077113 – MANUFACTURED COPINGS

- K. Bituminous paint, as provided by the flashing or steep-slope roofing contractor or materials vendor, where required for isolation of materials to prevent galvanic reaction between dissimilar metals. Refer to Section 076200 – Sheet Metal Flashing and Trim.

2.4 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch unless otherwise noted.
- D. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- E. Refer to drawings for coping profiles. Pitch tops of all copings toward roof, 1/4" per foot minimum.
- F. Install coping system manufacturer's splice plates and adhesive neoprene sealant strips at splices as directed by coping system manufacturer.
- G. Where not possible to utilize factory-fabricated corner and end components, fabricate corners and end caps from a single piece, minimizing joints, splice to adjacent material runs and apply minimum sealant as required for water-tight installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that the substrate is dry, clean and free of foreign matter.
- C. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Prepare substrates as required to provide surfaces that are smooth, sound, clean, dry and free from defects that might affect flashing performance.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Verify that manufactured components fit properly in place as indicated in the drawings prior to proceeding with installation.

3.3 INSTALLATION

- A. Install sheet metal copings and associated components, accessories and hardware in accordance with the SMACNA Architectural Sheet Metal Manual and manufacturer's instructions.
- B. Install coping materials in conjunction with other trades so that adjacent flashing and membrane positions are joined together and sealed as required to provide a water-tight installation.
- C. Apply bituminous paint between dissimilar materials where required to prevent galvanic reaction and corrosion.
- D. Conform to drawing details.
- E. Snap copings in-place without exposed fasteners. Fastener use is limited to the cleat system.
- F. Fit copings tight in place in compliance with wind-uplift criteria. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- G. Remove adhered protective plastic coverings from metal materials immediately after installation or from concealed surfaces prior to installation.
- H. Apply sealants minimally as required to provide water-tight joints in accordance with Section 079200 – Joint Sealants.

CHASE
SECTION 077113 – MANUFACTURED COPINGS

3.4 CLEANING

- A. Where adjacent finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning requirements and conform to their documented instructions.
- B. Remove all debris, tools and equipment from the project site after completion of the work.

3.5 PROTECTION

- A. Protect installed components until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

CHASE
SECTION 077123 - DOWNSPOUTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Downspouts and related accessories.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry.
- B. 076200 – Flashing and Sheet Metal Trim.
- C. 079000 - Joint Sealants

1.3 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. Architectural Sheet Metal Manual (ASMM); Sheet Metal and Air Conditioning Contractors' National Association (SMACNA); latest edition.
- C. AAMA 1405.1 – Specification for Aluminum Rain-carrying Systems; American Architectural Manufacturers Association (AAMA); latest edition.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for size and method of rainwater discharge.

1.5 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.
- C. Shop Drawings: Prepared specifically for this project; showing dimensions of metal gutters and accessories, fastening details and connections and interface with other products.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- F. Manufacturers warranties.

1.6 QUALITY ASSURANCE

- A. Fabrication and installation of downspout components shall be by a sole source.
- B. Fabricator / Installer shall have not less than 5 years experience fabricating and installing downspouts on projects of similar scope.
- C. Fabricator / Installer shall perform all work in accordance with the SMACNA Architectural Sheet Metal Manual.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products to prevent twisting, bending, and abrasion, and to provide ventilation.
- C. Slope stored materials to drain.
- D. During storage prevent contact with materials capable of causing discoloration, staining, or other damage.

1.8 PROJECT CONDITIONS

- A. Coordinate installation with installation of adjacent roofing, siding and related materials.

CHASE
SECTION 077123 - DOWNSPOUTS

1.9 WARRANTY

- A. Provide the Manufacturer's Limited 20-Year, pro-rated and non-transferable Warranty covering labor materials.

1.10 COORDINATION

- A. Coordinate Work with other operations and installation of floor finish materials to avoid damage to installed underlayment and membrane materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 1. Englert, Inc., www.englertinc.com.
- 2. Dimensional Metals, Inc., www.dmimetals.com.
- 3. Substitutions: See Section 016000.

2.2 MATERIALS

- A. Sheet metal: continuous and seamless roll-formed Aluminum sheet compliant with ASTM B 209, Alloy 3105-H24 with factory-applied min. 70% Kynar high performance organic fluoropolymer coating, color as indicated on drawings.

2.3 COMPONENTS

- A. Downspouts: 3" diameter, corrugated, 0.032" min. thickness.
- B. Downspout brackets: 0.063" min. thickness.
- C. Sealant: refer to Section 079200 – Joint Sealants.
- D. Fasteners: Aluminum, color as indicated on drawings.

2.4 FABRICATION

- A. Form downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.
- D. Hem exposed edges of metal.
- E. Fabricate downspout accessories.
- F. Seal all seams and joints watertight.

2.5 FACTORY FINISHING

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify governing dimensions at building.
- C. Verify surfaces are ready to receive downspouts.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

CHASE
SECTION 077123 - DOWNSPOUTS

- B. Clean and repair, if necessary, any adjoining work on which this work is in any way dependent for its proper installation.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care in placing aluminum in contact with other dissimilar metals or materials that are not compatible with aluminum.
- C. Providing adequate insulation/separation wherever necessary, such as by painting or otherwise protecting when they are in contact with aluminum or when drainage from them passes over Aluminum surfaces.
- D. Install sealants where indicated to clean dry surfaces only without skips or voids.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

CHASE
SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manufactured roof equipment curbs, rails, and other mounting apparatus.
- B. Manufactured pipe, duct, and conduit mounting pedestals.
- C. Manufactured roof hatches / scuttles for roof access.
- D. Custom-fabricated equipment screens.

1.2 RELATED SECTIONS

- A. 051200 – Structural Steel
- B. 055000 – Metal Fabrications
- C. 061000 – Rough Carpentry
- D. 075400 – Thermoplastic Membrane Roofing
- E. 079200 – Joint Sealants
- F. 099000 – Paintings and Coatings
- G. Division 23 – Heating, Ventilating and Air-Conditioning

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A36 – Standard Specification for Carbon Structural Steel.
 - 2. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A325 – Standard Specification for Structural Steel Bolts, Steel, Heat Treated, 120.105 ksi Minimum Tensile Strength.
 - 4. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 5. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 6. ASTM A 792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated By The Hot-Dip Process.
 - 7. ASTM A 780 – Standard Practice for Repair of Damaged Areas of Hot-Dip Galvanized Coatings.
 - 8. ASTM B 209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. Underwriters Laboratories (UL)
 - 1. UL 790 – Standard for Standard Test Methods for Fire Tests of Roof Coverings.
- C. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Hot Dip Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
 - 2. AAMA 2603 - Voluntary Specifications, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Installation methods.
 - 3. Maintenance requirements.
 - 4. Notice of acceptance: where required in hurricane zones, by authorities having jurisdiction.
- C. Shop drawings: all custom-manufactured assemblies.

CHASE
SECTION 077200 - ROOF ACCESSORIES

PART 2 - PRODUCTS

2.1 ROOF HATCHES / SCUTTLES

- A. Roof access hatch / scuttle (30"x36" clear opening) manufacturers, products:
 - 1. Bilco Co., www.bilco.com:
 - a. Non-hurricane zones: Model S-20
 - b. Hurricane zones: Model S-20HZ
 - 2. Milcor Inc., www.milcorinc.com – Model RB-1
 - 3. Substitutions: refer to Section 016000.
- B. Cover and frame material: 14-gauge ASTM A653 G90 galvanized steel, factory primed for field finishing. For painting requirements, refer to Section 099000 – Paints and Coatings.
- C. Cover fabrication: Hollow-metal design with 1" minimum concealed fiberglass or rigid foam insulation and flange with welded corners overlapping frame, internally reinforced for a 40 lb. minimum live load.
- D. Curb: 12" minimum height, integral cap flashing, 1" minimum fiberboard insulation, welded corners, with mounting flange including pre-drilled deck-fastening holes.
- E. Hinges: Type 316 stainless steel with 3/8" min. diameter pin.
- F. Operating hardware
 - 1. Zinc, Chrome or Cadmium-plated interior and exterior lever handles with interior hasp.
 - 2. Automatic hold-open lifting arm with grip handle release.
 - 3. Compression spring struts in telescoping steel tubes secured to unit frame.
- G. Gasket: extruded EPDM rubber strip permanently adhered to cover.
- H. Performance ratings required
 - 1. Roof material burning characteristics: UL 790, Class A.
 - 2. Jurisdictional approvals in hurricane zones as required.

2.2 ROOF LADDER SAFETY POST

- A. Manufacturers, products
 - 1. Bilco Co., www.bilco.com – LadderUP LU-1
 - 2. Milcor Inc., www.milcorinc.com – Upright Safety Bar
 - 3. Substitutions: refer to Section 016000.
- B. Product construction and operation options
 - 1. Telescoping spring-loaded tubular steel sections with automatic locking device at full extension.
 - 2. Non-telescoping tubular steel section hinge-mounted to roof hatch / scuttle frame with automatic locking device at upright position.
- C. Attachment options
 - 1. Telescoping device: Post manufacturer's U-bolts field-installed to center of roof access ladder rungs.
 - 2. Hinged device: factory-installed to inside face of roof hatch / scuttle frame.
 - 3. Hinged device: field-installed to inside face of roof hatch / scuttle frame.
- D. Finish options
 - 1. Factory-applied yellow powder-coat finish- field finishing not required.
 - 2. Factory-primed for field finish: refer to Section 099000 – Paints and Coatings.

2.3 MANUFACTURED EQUIPMENT CURB AND RAIL SYSTEMS

- A. Aluminum or galvanized steel rail equipment support systems
 - 1. Manufacturers, products
 - a. Avcoa., www.avcoausa.com – Hurricane Stand
 - b. Eberl Iron Works, eberliron.com,
 - c. Substitutions: refer to Section 016000.
 - 2. Base post and plate: flat Aluminum or hot-dip galvanized steel plate shop-welded to round structural tube, capped water-tight by shop-welded top plate, length as required to extend through roof insulation and allow proper installation of roofing membrane flashing boot.

CHASE
SECTION 077200 - ROOF ACCESSORIES

3. Equipment support framing: extruded Aluminum tubes or structural shapes or drawn hot-dip galvanized steel structural tubes or shapes- sized as required to support loads imposed.
 4. Fasteners: A325 stainless steel.
 5. Vibration isolation material: by HVAC contractor – refer to Division 23 – Heating, Ventilating and Air-Conditioning.
 6. Flashing: by roofing contractor- refer to Section to 075400 – Thermoplastic Membrane Roofing.
 7. Equipment tie-downs: by HVAC contractor – refer to Division 23 – Heating, Ventilating and Air-Conditioning.
 8. Finish: not required.
 9. Notice of acceptance: where required in hurricane zones, by authorities having jurisdiction.
- B. Curbs and curb rails**
1. Curbs: manufacturers, products
 - a. Thybar, www.thybar.com, TC-3.
 - b. The Pate Co., www.patecurbs.com, PC-4-IL.
 - c. Curbs Plus, www.curbs-plus.com, CPC-3; requires additional 14-gauge counterflashing.
 - d. Substitutions: refer to Section 016000.
 2. Curb rails: manufacturers, products
 - a. Thybar, www.thybar.com, TEMS 3.
 - b. The Pate Co., www.patecurbs.com, ES-2.
 - c. Curbs Plus, www.curbs-plus.com, CPES-3.
 - d. Substitutions: refer to Section 016000.
 3. Product requirements
 - a. ASTM A653 G90 14-gauge galvanized steel based with continuous welded corner seams and internal reinforcing as required to support loads imposed.
 - b. Wood-preserved-treated 2x4 nailer with 18-gauge ASTM A653 G90 galvanized steel counter-flashing cover.
 - c. Height and base slope as required to maintain level top with minimum 8" height above roofing membrane. Height Above Roof Deck: 14 inches, minimum.
 - d. Insulate inside curbs with 1-1/2 inch thick XPS or Polyiso rigid board, R-7.5 min.
 - e. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
 - f. Fasteners: A325 stainless steel.
 - g. Vibration isolation material: by HVAC contractor – refer to Division 23 – Heating, Ventilating and Air-Conditioning.
 - h. Flashing: by roofing contractor- refer to Section to 075400 – Thermoplastic Membrane Roofing.
 - i. Equipment tie-downs: by HVAC contractor – refer to Division 23 – Heating, Ventilating and Air-Conditioning.
 - j. Finish: not required.
 - k. Notice of acceptance: where required in hurricane zones, by authorities having jurisdiction.

2.4 PIPE, DUCT AND CONDUIT MOUNTING PEDESTALS

- A. Product requirements**
1. 14-gauge hot-dip galvanized steel channel for attachment of pipe / duct installer's clamp or height-adjusting hardware, mill finish.
 2. Clear height from roof surface to bottom of supported element: 6", minimum.
 3. Support base: UV-resistant rubber or plastic, approved for use with specified roofing material.
 4. Manufacturers, products
 5. Mifab, www.mifab.com, #C610
 6. Dura-Blok, www.cooperindustries.com, #DB610.
 7. Miro Industries, www.miroind.com, Model 2.5.
 8. Substitutions: refer to Section 016000.

2.5 METAL AND MISC. MATERIALS FOR CUSTOM SHOP-FABRICATED ELEMENTS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation and mill phosphatized for field painting where indicated.**
1. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting

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SECTION 077200 - ROOF ACCESSORIES

- topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
2. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 3. Mill-Phosphatized Finish: Manufacturer's standard for field painting. Refer to Section 099000 – Paints and Coatings.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.
1. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 2. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 3. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
- C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required. (Shop finishes)
1. Mill Finish: As manufactured.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
 3. Two-Coat Fluoropolymer Finish: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 4. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- D. Aluminum extrusions and tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, field-painted- refer to Section 099000 – Paints and Coatings.
- E. Structural steel shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M, field-painted- refer to Section 099000 – Paints and Coatings.
- F. Steel Pipe: ASTM A 53/A 53M, galvanized, field-painted- refer to Section 099000 – Paints and Coatings.
- G. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A123 / A123M, field-painted- refer to Section 099000 – Paints and Coatings.
- H. Wood-preservative treated dimension lumber – refer to Section 061000 – Rough Carpentry.
- I. Insulation: closed-cell rigid boards, extruded polystyrene or polyisocyanurate. Refer to Section 072113 – Board Insulation.
- J. Fasteners: AISC A325 stainless steel
- K. Flashings: single-ply adhesive sheet compatible with roofing membrane, with stainless steel ring clamps where required- refer to Section 075400 – Thermoplastic Membrane Roofing.
- L. Sealants: compatible with the materials in contact and as indicated in Section 079200 – Joint Sealants.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

CHASE
SECTION 077200 - ROOF ACCESSORIES

- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, 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 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 felt underlayment and cover with a slip sheet.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof Curb Installation: Install each roof curb so top surface is level.
- D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
- E. Roof-Hatch Installation:
 - 1. Install roof hatch so top surface of hatch curb is level.
 - 2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 3. Attach safety railing system to roof-hatch curb.
 - 4. Attach ladder-assist post according to manufacturer's written instructions.
- F. Gravity Ventilator Installation: Verify that gravity ventilators operate properly and have unrestricted airflow. Clean, lubricate, and adjust operating mechanisms.
- G. Pipe Support Installation: Install pipe supports so top surfaces are in contact with and provide equally distributed support along length of supported item.
- H. Seal joints with elastomeric sealant as required by roof accessory manufacturer and compatible with materials in contact.

3.3 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting.
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- F. Protect installed products until completion of project.
- G. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

CHASE
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Liquid-applied joint sealants and related backing and release materials.

1.2 RELATED SECTIONS:

- A. Divisions 3-9, all sections.

1.3 REFERENCES

- A. American Society for Testing and Materials International (ASTM)
 - 1. ASTM C719: Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement; latest edition.
 - 2. ASTM C834: Standard Specification for Latex Sealants; latest edition.
 - 3. ASTM C920: Standard Specification for Elastomeric Joint Sealants; latest edition.
 - 4. ASTM C1193: Standard Guide for Use of Joint Sealants; latest edition.
 - 5. ASTM C1382: Standard Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints; latest edition.
 - 6. ASTM C1472: Standard Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width; latest edition.
 - 7. ASTM C1667: Standard Test Method for Using Heat Flow Meter Apparatus to Measure the Center-of-Panel Thermal Resistivity of Vacuum Panels; latest edition.
 - 8. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials; latest edition.
 - 9. ASTM E814: Standard Test Method for Fire Tests of Penetration Firestop Systems; latest edition.
- B. FMRC Approval Guide; FM Global; latest edition.
- C. UL Fire Resistance Directory; Underwriters Laboratories; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide product manufacturer's data sheets for each type and use of sealant, indicating applicability and compatibility with the materials in contact.
- C. Samples: Submit two samples, 3/8 x 10 inches in size illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Applicator qualifications: Company specializing in performing the work of this section and/or the related section with minimum 5 years experience or as otherwise indicated in the related section.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in their original sealed containers bearing the manufacturer's name and identification of the material.
- B. Store containers in a dry interior room, protected from moisture and humidity, and out of direct sunlight.

1.7 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant and base material manufacturers during and after installation until sealants are fully cured.

CHASE
SECTION 079200 - JOINT SEALANTS

1.8 COORDINATION

- A. Coordinate the work with all sections referencing this section. Execute sealant work concurrent with the work of other trades as required to maintain construction sequencing.

1.9 WARRANTY

- A. See Section 017800 for additional warranty requirements.
- B. Correct defective work within a five-year period after Date of Substantial Completion.
- C. Labor warranty: Sealant installer shall provide 1-year labor and materials warranty against sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Pecora Corporation: www.pecora.com.
- B. 3M: www.solutions.3m.com.
- C. General Electric: www.siliconeforbuilding.com.
- D. Dow-Corning Corporation: www.dowcorning.com.
- E. Sika Group: www.usa.sika.com.
- F. BASF Building Systems (Sonneborn): www.buildingsystems.basf.com.
- G. Tremco Commercial Sealants and Waterproofing: www.tremcosealants.com.
- H. Dap Products, Inc.: www.dap.com.
- I. C.R. Lawrence Co., Inc.: www.crlawrence.com
- J. Substitutions: refer to Section 016000.

2.2 SEALANTS

- A. General
 - 1. Provide only sealant materials and primers having lower volatile organic compound (VOC) content than required by authorities having jurisdiction.
 - 2. Where sealant type is not indicated in the drawings, product specifications, or in this Section, select type in accordance with ASTM C1472 and C1193.
 - 3. All exterior sealants shall be ASTM C920 Type S single-component products, liquid-applied and gun-grade unless noted otherwise.
 - 4. All interior sealants shall be ASTM C834 single-component products, liquid-applied and gun-grade unless noted otherwise.
- B. Sealant types
 - 1. Type A – General-purpose exterior sealant
 - a. Single component silicone, ASTM C920, Type S, Grade NS, Class 50, uses M, G, and A.
 - b. Standard color to match adjacent finish surfaces or as otherwise noted.
 - 2. Type B – General-purpose interior sealant:
 - a. Single component acrylic emulsion latex; ASTM C834, Type OP, Grade NF.
 - b. Paintable, manufacturer's standard color to match adjacent finish surfaces or as otherwise noted.
 - 3. Type C – Sanitary sealant
 - a. Single component silicone; ASTM C920, Type S, uses I, M and A.
 - b. Mildew resistant.
 - c. Standard color to match adjacent finish surfaces or as otherwise noted.
 - 4. Type D – Optically clear interior partition glazing adhesive
 - a. Single-component structural silicone adhesive sealant, ASTM C920, Type S, Class 25, uses G and A.
 - b. Color: clear, unless otherwise noted.

CHASE
SECTION 079200 - JOINT SEALANTS

- c. Use sealant manufacturer's recommended solvent products for preparation and cleanup.
- d. Mask glass panel faces with pressure-sensitive tape as directed by sealant manufacturer.
- e. Products
 - 1) C.R. Lawrence #WCS1, #WCS5: Water Clear silicone.
 - 2) 3M #230 Crystal Clear thermoplastic elastomer.
- 5. Type E - Concrete paving joint sealant
 - a. Single-component non-sag polyurethane, ASTM C920, Type S, Class 50, Grade SG, Uses T, I, M and A.
 - b. Color: Gray.
- 6. Type F – Intumescent sealants for penetrations of fire-resistance-rated assemblies
 - a. Single-component gun-grade elastomeric firestop sealant, ASTM E814.
 - b. Apply as indicated by UL assembly to achieve required fire resistance rating.
 - c. Color: red or red-brown.
- 7. Type G – EIFS and DEFS control joint and weather sealant
 - a. Single-component gun-grade elastomeric silicone or polyurethane sealant, ASTM C920, Type S, Grade NS.
 - b. Compliant with ASTM C1382.
 - c. Backer rod shall be closed-cell polyethylene foam.
 - d. Verify compatibility with finish system manufacturer.

2.3 ACCESSORIES

- A. Primer: Non-staining type, as recommended by sealant and substrate manufacturers to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, as recommended by sealant and substrate manufacturers, compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC or polyethylene as indicated by sealant or substrate manufacturer; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape as recommended by sealant manufacturer to suit application.
- E. Solvents and other preparation and cleanup materials: as recommended by sealant manufacturer and compatible with substrates, not causing deleterious effects to finish surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work. Notify General Contractor immediately of required preparation work. Do not proceed with sealant installation until surfaces are properly prepared.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Prepare surfaces to receive sealants, clean and prime joints (where required) in accordance with manufacturer's instruction and ASTM C 1193.
- C. Perform preparation in accordance with sealant manufacturer's instructions
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C 1193.
- B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

CHASE
SECTION 079200 - JOINT SEALANTS

- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges.
- F. Tool joints concave.

3.4 CLEANING

- A. Clean adjacent surfaces soiled by performance of the work of this Section.

3.5 PROTECTION

- A. Protect sealants until cured.
- B. Maintain air temperature and humidity at sealant materials as prescribed by sealant manufacturers until sealants are fully cured.

3.6 SCHEDULE

- A. Exterior joints for which no other sealant type is indicated: Type A.
- B. Control and expansion joints in paving: Type E.
- C. Control, expansion, and soft joints in masonry or stucco, and between masonry or stucco and adjacent materials: Type A.
 - 1. In masonry, color-match to mortar / grout.
 - 2. In stucco, color-match to stucco.
- D. Control, penetration and perimeter weather-resistant joints in EIFS and DEFS: Type G.
- E. Joints between exterior metal frames and adjacent materials: Type A. Color-match to adjacent material.
- F. Under exterior door thresholds: Type A.
- G. Interior joints for which no other sealant type is indicated: Type B.
- H. Joints between plumbing fixtures or piping and walls or floors: Type C.
- I. Joints between millwork, trim, counters, splashes or similar built-in finish materials and components and walls: Type B.
- J. Interior glass partition joints: Type D.
- K. As firestop material in interior fire-resistance-rated construction assemblies: Type F.
- L. Sound insulation or acoustic-control material: Type B.

END OF SECTION

CHASE
SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Steel frames for wood doors.
- C. Thermally insulated steel doors.

1.2 RELATED SECTIONS

- A. 079200 – Joint Sealants
- B. 087100 – Door Hardware
- C. 099100 – Paints

1.3 REFERENCES

- A. American National Standards Institute / International Code Council (ANSI/ICC)
 - 1. ANSI/ICC A117.1: American National Standard for Accessible and Usable Buildings and Facilities; latest edition.
- B. American National Standards Institute / Steel Door Institute (ANSI/SDI)
 - 1. ANSI A250.8 / SDI-100: Recommended Specifications for Standard Steel Doors and Frames; latest edition.
 - 2. ANSI/SDI A250.10: Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; latest edition.
- C. American National Standards Institute / Builders Hardware Manufacturers Association (ANSI/BHMA)
 - 1. ANSI/BHMA A156.115: Hardware Preparation in Steel Doors and Steel Frames; latest edition.
- D. American National Standards Institute / Door and Hardware Institute (ANSI/DHI)
 - 1. ANSI/DHI A115 Series: Specifications for Steel Doors and Frame Preparation for Hardware; latest edition.
- E. American Society for Testing and Materials International (ASTM)
 - 1. ASTM A 653/A 653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; latest edition.
 - 2. ASTM A1008: Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; latest edition.
- F. National Association of Architectural Metal Manufacturers / Hollow Metal Manufacturers Association (NAAMM/HMMA)
 - 1. NAAMM/HMMA 840: Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; latest edition.
 - 2. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; latest edition.
- G. National Fire Prevention Association (NFPA)
 - 1. NFPA 80: Standard for Fire Doors and Other Opening Protectives; latest edition.
- H. Underwriters Laboratories (UL)
 - 1. UL10B: Fire Tests of Door Assemblies; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Submit door and frame schedule, product data and details of each opening, showing elevations, glazing, frame profiles, and finishes, if any, for approval by the Architect of Record, of each type of door and frame.
- C. Warranty, executed in Owner's name, at project close-out.

1.5 QUALITY ASSURANCE

- A. Manufacturer shall be limited to companies specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Maintain at the project site a copy of all reference standards pertaining to installation of products addressed by this Section.
- C. All exterior doors and frames shall be provided by a single manufacturer and installed by a sole-source vendor.
- D. All interior doors and frames shall be provided by a single manufacturer and installed by a sole-source vendor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. All doors and frames delivered to the site for installation shall be stored vertically on 4" minimum high non-pressure-treated wood skids, under cover, and protected from excess humidity. A 1/4" space between the doors shall be provided to promote air circulation.
- C. Doors and frames shall be delivered to the jobsite in manufacturer's unopened protective wrapping. Wrapping shall remain in place until time of installation. If the wrapper on the door becomes wet, it must be removed immediately.
- D. The use of non-vented plastic or canvas shelters that can create a humidity chamber is not permitted.
- E. Factory-installed temporary shims and strike bolts in pre-hung doors intended to maintain required tolerances between frame and door shall remain in-place until frame is permanently installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Doors and Frames:
 - 1. Ceco Door Products: www.cecodoor.com.
 - 2. Windsor Republic Doors: www.republicdoor.com.
 - 3. Steelcraft: www.steelcraft.com.
 - 4. Substitutions: refer to Section 016000.
- B. Accessory and hardware items
 - 1. As provided by or as recommended by frame and door manufacturer, or as scheduled in the drawings.
 - 2. Substitutions: not permitted.

2.2 HOLLOW METAL DOORS AND FRAMES

- A. General requirements for all metal doors and frames
 - 1. Doors and frames shall be manufactured, prepared for hardware and delivered in accordance with ANSI/SDI-100.
 - 2. Frames shall be 'double-rabbit' type, manufactured of a single continuous steel sheet.
 - 3. Where possible, doors shall be fabricated as complete assemblies within shop-welded frames for delivery to the jobsite.
 - 4. Frame corners shall be mitered and face-welded. Butt joints are not acceptable.
 - 5. Mullions and shop or field splices shall have internally-reinforced connections welded to the perimeter frame.
 - 6. Sizes, hinging, handing and other features of doors and frames shall be as indicated in the Door Schedule and Floor Plans in the drawings.
 - 7. Anchorage to wall framing and finishes shall be as indicated in the manufacturer's installation instructions for the type of construction, as indicated in the Construction Drawings, and in accordance with ANSI/SDI-100.
 - 8. Accessibility: comply with ANSI/ICC A117.1.

CHASE

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

9. Door top and bottom closures shall be flush with faces and edges. Shop- and field-undercuts shall be internally reinforced by fabricator or installer with 16-gauge channels welded prior to installation as required to prevent face deflection.
 10. Doors shall be beveled on both vertical edges.
 11. All door and frame surfaces shall be factory-primed, smooth texture, for field finishing by Painter.
 12. Hardware preparation work shall be performed in accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 13. For frames set in masonry walls
 - a. Size to suit masonry coursing with head member 4 inches high or as otherwise required to fill opening without cutting masonry units.
 - b. Provide mortar guard boxes for hardware cut-outs in frames to be grouted.
- B. Exterior doors and frames
1. Minimum grade standard shall be ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless construction.
 2. Frame and door material shall be minimum 16-gauge / .053" thickness hot-dip Galvannealed steel in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
 3. Core material shall be solid polyurethane closed-cell foam thermal insulation.
 4. Weather stripping: refer to Section 087100 – Door Hardware.
 5. Frames shall be anchored to masonry with mechanical ties, utilizing minimal grout as required, without thermal bridging to the interior. Remaining concealed frame voids shall be filled completely with thermal insulation. Refer to Section 072140 – Spray-Applied Foam Insulation. Insulation shall be applied by frame installer or coordinated by installer with insulation contractor for completion prior to completion of interior wall finishes.
- C. Interior doors and frames, non-fire-resistance rated, including steel frames for flush wood doors
1. Minimum grade standard shall be ANSI A250.8 Level 2, physical performance Level B, Model 1, seamless construction.
 2. Frame and door material
 - a. Doors in high-humidity areas or otherwise exposed to moisture shall be minimum 16-gauge / .053" thickness hot-dip Galvannealed steel in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
 - b. Doors in other areas shall be minimum 16-gauge / .053" thickness cold-rolled steel sheet in accordance with ASTM A1008.
 3. Core material shall be honeycomb polyurethane or Kraft paper.
- D. Fire-resistance-rated door and frame assemblies
1. Door and frame assemblies shall be tested and rated to the minimum fire resistance rating indicated in the construction drawings.
 2. The door and frame shall be a factory-assembled unit, manufactured, installed and labeled according to the requirements of NFPA 80 and authorities having jurisdiction.
 3. The door hardware installer shall be responsible for providing and installing all controls, hardware and accessory materials required to meet the requirements of the assembly tested and labeled in accordance with UL 10B.
- E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for fire-resistance-rated doors. Where two requirements conflict, comply with the most restrictive requirement.

2.3 HARDWARE

- A. Factory- or shop-provided hardware shall be as indicated in the Door Hardware Schedule in the construction drawings and Section 087100 – Door Hardware.

2.4 ACCESSORY MATERIALS

- A. Louvers shall be roll-formed steel or Aluminum with overlapping frame; sight-proof inverted V-shaped blades; finish matching the door.

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

- B. Grout for frames set in masonry shall be Portland cement grout of maximum 4-inch slump for hand troweling; thinner pump-grade grout is prohibited.
- C. Silencers shall be resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- D. Temporary frame spreaders shall be provided for all factory- or shop-assembled frames.
- E. Thresholds, weather stripping, head and sill flashing, and perimeter sealant shall be provided and installed by the door installer as indicated in the Door Hardware Schedule in the construction drawings and Section 087100 – Door Hardware.
- F. Door frame framing anchors shall be as recommended or provided by the door frame manufacturer, of material compatible with framing or masonry materials to exclude the possibility of galvanic corrosion.

2.5 FINISH MATERIALS

- A. Primer shall be rust-inhibiting and compliant with ANSI A250.10, factory-applied by the door and frame manufacturer.
- B. Finish painting shall be by the painting contractor- refer to Section 099100 – Paints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

- A. Frames shall be installed plumb, level, rigid and in true alignment. Doors shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance. Doors shall be adjusted to maintain perimeter clearances. Shimming shall be performed by the installer as needed to assure the proper clearances are achieved.
- B. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Steel Frames, including fire-resistance-rated frames in interior walls do not require grouting.
- F. Coordinate installation of hardware and electrical connections to electrical hardware items.

3.4 ERECTION TOLERANCES

- A. Maximum diagonal distortion shall be 1/16" measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.6 CLEANING

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
- B. Remove all scrap and construction debris from the site.

3.7 PROTECTION

- A. Protect finished work under provisions of Section 017000.

CHASE
SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

END OF SECTION

CHASE
SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Solid-core flush wood doors with paint-grade faces.
- B. Factory pre-machining for hardware, detailing, and factory priming.

1.2 RELATED SECTIONS

- A. 081113 – Hollow Metal Doors and Frames
- B. 087100 – Door Hardware
- C. 099100 – Paints

1.3 REFERENCES

- A. *Architectural Woodwork Standards*; Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute (AWI/AWMAC/WI); latest edition.
- B. ANSI/WDMA IS 1A: *Industry Standard for Wood Flush Doors*; Window and Door Manufacturers Association (WDMA); latest edition.
- C. National Fire Prevention Association (NFPA)
 - 1. NFPA 80: *Standard for Fire Doors and Other Opening Protectives*; latest edition.
 - 2. NFPA 252 - *Standard Methods of Fire Tests for Door Assemblies*; latest edition.
- D. Underwriters Laboratories (UL)
 - 1. UL10B: *Fire Tests of Door Assemblies*; latest edition.
- E. Intertek Group PLC
 - 1. Warnock Hersey certification listings for fire doors.

1.4 SUBMITTALS

- A. Refer to Section 013000 for submittal procedures.
- B. Submit to Architect of Record for review and approval
 - 1. Product Data: Submit door manufacturer's product construction data, hardware attachment performance data, specifications and installation instructions for each type of wood door, including details of core and edge construction, trim for lite openings and similar components, and finish primer specifications.
 - 2. Shop drawings; include the following information:
 - a. Door type.
 - b. Door size.
 - c. Fire Rating
 - 1) Neutral pressure.
 - 2) Positive pressure.
 - d. Hardware types and locations, including blocking requirements and location.
 - 3. Two samples of door construction, 12" x 12" cut from top corner of door.

1.5 QUALITY ASSURANCE

- A. Manufacturer shall be limited to companies specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Maintain at the project site a copy of all reference standards pertaining to installation of products addressed by this Section.
- C. All interior solid core flush wood doors shall be provided by a single manufacturer and installed by a sole-source vendor.
- D. Products and work of this Section shall comply with WDMA *Industry Standard for Wood Flush Doors* or AWI *Architectural Woodwork Standards*.

CHASE
SECTION 081416 - FLUSH WOOD DOORS

- E. Fire-resistance-rated wood doors shall comply with NFPA-80 and the requirements of local authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's original unopened packaging. Inspect and return any damaged units.
- C. Store doors vertically on 4" minimum high non-pressure-treated wood skids, under cover, and protected from excess humidity. A 1/4" space between the doors shall be provided to promote air circulation.
- D. Break seal of manufacturer's packaging on-site to permit ventilation. Do not store in damp or wet areas, or in direct sunlight. If stored on-site for more than one week, seal top and bottom edges with tinted sealer.
- E. Do not subject interior doors to extremes in either heat or humidity. HVAC systems must be operational and balanced, providing a temperature range of 50 to 80 degrees Fahrenheit and 25% to 55% relative humidity.
- F. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
- G. At time of delivery, mark each door on top rail with opening number.

1.7 SEQUENCING

- A. Coordinate the work with door opening construction, door frame and door hardware installation.
- B. Field-verify dimensions and details of existing steel frames and indicate on shop drawings.

1.8 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Specific product warranty: The interior doors shall be warranted by the manufacturer to be free of manufacturing defects for the life of the original installation. Warranty shall provide for repair or replacement of the defective door(s) as originally furnished at manufacturer option. Manufacturer may, per its discretion, elect to use either its own, or third-party resources to resolve warranty claims.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Solid-core flush wood doors
 - 1. Eggers Industries; www.eggiersindustries.com.
 - 2. Algoma Hardwoods.; www.algomahardwoods.com.
 - 3. Weyerhaeuser Co.; www.weyerhaeuser.com.
 - 4. Graham Manufacturing; www.grahamdoors.com.
 - 5. Marshfield Door Systems; www.marshfielddoors.com.
 - 6. Substitutions: refer to Section 016000.
- B. Accessory and hardware items
 - 1. As indicated in the Door Hardware Schedule in the construction drawings, or as provided by or recommended by frame or door manufacturer,
 - 2. Substitutions: not permitted.

2.2 DOORS

- A. General requirements (including doors fire-resistance-rated up to 20 minutes)
 - 1. Minimum performance standard: Extra Heavy Duty.
 - 2. Fabricate the work of this section to WDMA "Premium Grade" or AWS "Custom Grade" for PC-5 bonded core.
 - 3. Faces shall be medium-density overly (MDO), cold-press laminated to core with Type I waterproof adhesive.

CHASE
SECTION 081416 - FLUSH WOOD DOORS

4. Stiles and rails shall be mill option solid wood complying with the referenced quality standard, with 5" minimum top rail solid blocking.
 5. Cores may be the following materials, Type I glue bonded and sanded
 - a. ANSI A208.1-LD-2, Particleboard; PB.
 - b. Structural Composite Lumber; SCL-20.
 - c. Staves with one species per core; SLC-20.
 6. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions, and the specified quality standard.
 7. Factory fit and machine doors for frame and hardware in accordance with hardware and NFPA 80 requirements and dimensions. Do not machine for surface hardware. Apply appropriate fire labels where applicable.
 8. Size and thickness as indicated in the Door Schedule in the construction drawings.
- B. Requirements for doors fire-resistance-rated over 20 minutes
1. Interior solid core flush wood doors requiring 45-minute or 90-minute fire-resistance ratings shall have mineral cores and shall be fabricated in compliance with NFPA 80 requirements.
- C. Combined Requirements: If a particular door is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type. Where two requirements conflict, comply with the most restrictive requirement.

2.3 HARDWARE AND ACCESSORIES

- A. Factory- or shop-provided hardware shall be as indicated in the Door Hardware Schedule in the construction drawings and Section 087100 – Door Hardware.
- B. Metal louvers:
1. Refer to Mechanical systems drawings for size, openness and operating requirements.
 2. Material and finish: Roll formed steel or Aluminum frame and louvers; shop-painted to match door color as indicated on drawings.
 3. Louver blade: Inverted V blade, sight proof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- A. Install fire-resistance-rated and non-fire-resistance-rated doors in accordance with NFPA 80, Manufacturers' instructions and to Warnock-Hersey/UL requirements.
- B. Trim non-fire-resistance-rated door width by cutting equally on both jamb edges.
- C. Trim door height by cutting bottom edges to a maximum 3/4 inch (19-mm).
- D. Trim fire door height at bottom edge only, in accordance with fire rating requirements. Allow a fitting clearance of 1/8" at each side and at top of door.
- E. Use machine tools to cut or drill for hardware. Pilot drill screw and bolt holes using templates provided by hardware manufacturer.
- F. Coordinate installation of doors with installation of frames and hardware.
- G. Install door louvers plumb and level.
- H. Re-prime any doors that required site alteration.

3.3 INSTALLATION AND WARRANTY TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.

CHASE
SECTION 081416 - FLUSH WOOD DOORS

- B. Conform to WDMA standards and testing methods for warp, cup, bow and telegraphing.

3.4 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

CHASE
SECTION 083100 - ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Access door and frame units.

1.2 RELATED SECTIONS

- A. 092900 – Gypsum Board.
- B. 099100 – Paints.

1.3 REFERENCES

- A. American Society for Testing and Materials International (ASTM)
 - 1. ASTM A 653/A 653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; latest edition.
 - 2. ASTM A1008: Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; latest edition.
- B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

- A. Refer to Section 013000 for submittal procedures.
- B. Submit manufacturer's product data to Architect of Record for approval. Include sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Manufacturer's installation instructions.
- D. Following installation, document actual locations of all access panels and submit to Architect of Record for inclusion in As-Built drawings.

1.5 PROJECT CONDITIONS

- A. Coordinate the work of this Section with the work of trades requiring access doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Access Doors:
 - 1. Mifab, Inc.; www.mifab.com.
 - 2. Milcor Inc: www.milcorinc.com.

2.2 PRODUCT REQUIREMENTS

- A. All units shall be factory-fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp.
- B. Materials
 - 1. Units for interior exposure shall be fabricated of 16-gauge minimum cold-rolled steel sheet in compliance with ASTM A1008.
 - 2. Units for exterior exposure shall be fabricated of 16-gauge minimum hot-dip galvanized or Galvannealed steel sheet in compliance with ASTM A653.
- C. Hardware and operation
 - 1. Concealed pin-type hinges.
 - 2. Latches with screwdriver, Allen wrench or similar common tool operation shall be provided at all access panels in employee-only areas.
 - 3. Provide panel manufacturer's keyed cylinder locks at all access panels in customer areas. Locks shall all be keyed alike.
- D. All units shall be factory-primed for field painting.

CHASE
SECTION 083100 - ACCESS DOORS AND PANELS

2.3 ACCESS DOOR TYPES

- A. Non-fire-resistance-rated units in interior gypsum board walls and ceilings
 - 1. 'Flush' type with door face aligned with wall finish, including integral mounting flange and galvanized steel drywall edge bead, without an exposed perimeter frame.
 - 2. Approved products
 - a. Milcor model DW.
 - b. Mifab model MDW.
 - c. Substitutions: refer to Section 016000.
- B. Fire-resistance-rated units in interior gypsum board walls and ceilings
 - 1. Tested and labeled in compliance with UL Class B fire resistance for use as a 90-minute protective within a maximum 2-hour fire-resistance-rated wall or ceiling assembly.
 - 2. 'Flush' type door with door face aligned with integral perimeter steel frame overlaying surrounding wall or ceiling finish, with a gap for sealant application.
 - 3. Integral coil spring door closer and latch paddle or turn ring.
 - 4. Approved products
 - a. Milcor model UFR.
 - b. Mifab model MFRU.
 - c. Substitutions: refer to Section 016000.
- C. Exterior units set in EIFS or stucco walls and DEFS ceilings, and interior tile walls
 - 1. 'Flush' type door with door face aligned with integral perimeter steel frame overlaying surrounding wall or ceiling finish, with a gap for sealant application.
 - 2. Fasteners concealed at interior face of integral frame into adjacent framing.
 - 3. Approved products
 - a. Milcor model M.
 - b. Mifab model UA.
 - c. Substitutions: refer to Section 016000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that opening sizes and tolerances are acceptable, and that surface finishes will align as intended.
- B. Notify General Contractor immediately of unsatisfactory conditions. Do not proceed with work until corrected.

3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings. Secure rigidly in place.
- C. Position units to provide convenient access to the concealed work requiring access.
- D. For keyed units, place both keys on a common ring and insert key into lock, locking door in closed position

END OF SECTION

CHASE
SECTION 083323 – OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manufactured overhead rolling clear panel door assemblies and associated operating mechanisms, standby power systems and other miscellaneous work directly related to the overhead coiling door.

1.2 RELATED SECTIONS

- A. 051200 – Structural Steel (for products and execution of steel support components by overhead door installer)
- B. 054000 – Cold Formed Metal Framing
- C. 055000 – Metal Fabrications
- D. 061000 – Rough Carpentry
- E. 079200 – Joint Sealants
- F. 087100 – Door Hardware

1.3 REFERENCES

- A. JP Morgan Chase; *Chase Design Standards drawings*; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product data: Submit manufacturer's complete product data for all specified components, including specifications, finish information and installation instructions.
- C. Shop drawings: Submit shop drawings showing layout, sizes and types, product materials, components and accessories, fabrication data, operation and wiring diagrams for motor driven operators, finishes, rough-in dimensions, anchorage and installation requirements and details.
- D. Warranty, executed in Owner's name, at project close-out.

1.5 QUALITY ASSURANCE

- A. Manufacturer shall be limited to companies specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. All overhead coiling doors and associated components shall be provided by a single manufacturer, and installed by a sole-source vendor.
- C. All Lexan Panel rolling shutters shall be designed to a minimum standard life cycle of 15,000 operating cycles not exceeding 10 cycles per day.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in manufacturer's original, unopened, undamaged containers with identification labels intact. Wrapping shall remain in place until time of installation. If the wrapper on the door becomes wet, it must be removed immediately.
- B. Store unwrapped packages on wood skids preventing contact of packages with ground or concrete, under roof and protected from direct sunlight and precipitation.
- C. Protect packages from damage by other construction activity.

1.7 PROJECT CONDITIONS

- A. Field measurements: Verify actual measurements of openings by field measurement before fabrication. Show recorded measurements on shop drawing.

1.8 WARRANTY

- A. Overhead coiling doors shall be warranted against defects in workmanship and materials for a period of 1 year from date of shipment, provided designed cycle life is not exceeded. Painted and factory finishes are excluded from warranty.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. QMI Security Solutions, 1661 Glenlake Ave., Itasca, Illinois, 800-446-2500, www.qmiusa.com.
- B. Substitutions: not permitted.

2.2 PRODUCTS

- A. TR-4 Transparoll Transparent Slat Rolling Shutter.
- B. Product characteristics.
 - a. Curtain slats/ribs: Extruded Aluminum, 6063 alloy, T5 temper, with double interlocking hinges, and 0.090" x 2.00" vertical connecting links at 3'-0" on center max. End connecting links to be of sufficient width for proper guide rail travel.
 - b. Clear panels: 0.093" x 1.812" clear, flame retardant, UV resistant polycarbonate secured between the horizontal hinges through retaining channels and to the vertical links with molded nylon dividers.
 - c. Base slat: Extruded tubular Aluminum, 6063 alloy, T5 temper. Openings in excess of 12'-0" shall be reinforced.
 - d. Guide rails: Extruded Aluminum, 6063 alloy, T5 temper with insulating woven polypropylene wear strips to prevent metal-to-metal contact during operation. Profile shall prevent curtain pull-out under normal load conditions and include an adjustable internal stop to prevent upward over-travel.
 - e. End cap bracket plates: 0.1875" steel or 3/16" Aluminum bolted to the support tubes with manufacturer's provided hardware. Operator-side plates shall include grease-filled sealed roller bearing. Plates shall be of sufficient size to support curtain and drive barrel assembly.
 - f. Support tubes: 3"x3" steel tubes and base plates as recommended by manufacturer to support shutter. Tube supports are not to be considered structural building components.
 - g. Counter-balance drive barrel: 5" min. diameter round steel tube- verify size to meet the required maximum deflection of 0.035" per foot of width.
 - h. Spring balance: Oil-tempered helical torsion spring assembly including fittings mounted onto a solid steel shaft designed for an overload factor of 25%.
 - i. Motor operator: Provide industrial duty V-belt primary drive operator with roller chain/sprockets as recommended by manufacturer for size and type of shutter. Operator shall be complete with factory pre-wired motor control terminals with provisions for auxiliary push-up operation. The motor shall be high starting torque, protected internally against overload with auto-reset thermal sensing device. Motor starter shall be housed in a NEMA 1 housing and include a magnetic reversing starter (size O), a 24 volt control transformer, and a complete terminal strip to facilitate field wiring. Operator drive and driven sprockets shall be provided by #50 roller chain. Motor shall have a fully adjustable linear driven screw type cam limit switch to sync operator with shutter. The motor shall be activated by constant pressure applied by a key switch in a NEMA 1 enclosure. Motor shall be 115V, single-phase, min. 1/2 hp. All operators are UL listed.
 - j. Locking: Self-locking gearing and mechanical brakes within motor unit to hold shutter in closed position. Shutter curtain locking shall not be provided with motor operated shutters without an integrated lock sensing system or external guide rail mounted electrical interlocks.
 - k. Egress: Provide wall mounted manual emergency release lever to activate partial opening of shutter for emergency exit without the use of electrical power. Motor shall be restored to full normal operating mode upon release of egress lever to starting position. Release lever assembly must be installed with handle no higher than 48" above the finished floor.
 - l. Finishes: All exposed Aluminum shutter surfaces shall be clear anodized. Steel shall be mill finish primed, minimum.

CHASE
SECTION 083323 – OVERHEAD COILING DOORS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Preparation of the opening shall be the responsibility of others and shall not be completed by the manufacturer and/or its representative.
- B. Do not begin installation until substrates have been properly prepared. Contractor shall verify on site dimensions with shop drawings and assume full responsibility for fitting the components to the structure.
- C. Report discrepancies between design dimensions and field dimensions to the Architect and/or Owner's Representative. Do not proceed with installation until discrepancies are corrected, or until installation requirements are modified and approved by the Architect and/or Owner's Representative.
- D. Conduct pre-installation meeting to verify project installation and coordination requirements, field conditions, and manufacturer instructions.

3.2 INSTALLATION

- A. All products are to be installed by an authorized manufacturer's representative.
- B. Install all products with manufacturer approved hardware in accordance with manufacturer's instructions
- C. Install plumb and level, free of warp and distortion, and within tolerances specified by manufacturer.

3.3 ADJUSTMENTS

- A. Upon completion of installation, including work performed and completed by others, test and verify proper operation.

3.4 CLEANING

- A. Clean all surfaces soiled by installation as recommended by manufacturer. Remove all debris relating to installation and dispose of properly.

3.5 DEMONSTRATION

- A. Instruct owner and/or his representative on proper use and maintenance. Demonstrate all operations and verify acceptance.

3.6 PROTECTION

- A. Comply with manufacturers recommendations and protect completed shutter installation from damage during completion of remaining construction so as not to void warranty.

END OF SECTION

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Aluminum storefront exterior and interior framing and glazing system, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.
- B. Glazing materials, other than glazing units, for installation of glazing units in storefront framing.
- C. Flush insulated Aluminum exterior doors and associated hardware and components for installation in storefront framing.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry
- B. 079200 – Joint Sealants
- C. 087100 – Door Hardware
- D. 084400 – Curtain Wall and Glazed Assemblies
- E. 088000 – Glazing
- F. 088700 – Glazing Surface Films.
- G. 122413 – Roller Window Shades

1.3 REFERENCES

- A. American Architectural Manufacturers Association
 - 1. AAMA CW-10: *Care and Handling of Architectural Aluminum From Shop to Site*; American Architectural Manufacturers Association; latest edition.
 - 2. AAMA 501.2: *Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage* (part of AAMA 501); latest edition.
 - 3. AAMA 505: *Dry Shrinkage and Composite Performance Thermal Cycling Test Procedure*; latest edition.
 - 4. AAMA 506: *Voluntary Specifications for Impact and Cycle Testing of Fenestration Products*; latest edition.
 - 5. AAMA 507: *Standard Practice for Determining the Thermal Performance Characteristics of Fenestration Systems Installed in Commercial Buildings*; latest edition.
 - 6. AAMA 611: *Voluntary Specification for Anodized Architectural Aluminum*; latest edition.
 - 7. AAMA 1801: *Voluntary Specification for the Acoustical Rating of Exterior Windows, Doors, Skylights and Glazed Wall Sections*; latest edition.
 - 8. AAMA 1503: *Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections*; latest edition.
 - 9. AAMA TIR-A8: *Structural Performance of Composite Thermal Barrier Framing Systems*
- B. American Society for Testing and Materials International (ASTM)
 - 1. ASTM E90: *Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*; latest edition.
 - 2. ASTM B221: *Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes*; latest edition.
 - 3. ASTM B 456: *Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium*; latest edition.
 - 4. ASTM B 633: *Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel*; latest edition.
 - 5. ASTM C 920: *Standard Specification for Elastomeric Joint Sealants*; latest edition.
 - 6. ASTM E283: *Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen*; latest edition.
 - 7. ASTM E330: *Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*; latest edition.

8. ASTM E331: *Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*; latest edition.
9. ASTM E1425: *Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems*; latest edition.
10. ASTM E1886: *Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials*; latest edition.
11. ASTM E1996: *Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes*; latest edition.

1.4 PERFORMANCE REQUIREMENTS

- A. Aluminum-framed storefront system shall withstand the effects of the following design loading without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 1. Design Wind Loads: Determine design wind loads applicable to the Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - a. Basic Wind Speed: Refer to Structural Drawings.
 - b. Importance Factor: Refer to Structural Drawings.
 - c. Exposure Category: Refer to Structural Drawings.
- B. Delegated Design: Design glazed aluminum storefront, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated
- C. Minimum storefront system performance requirements, including glazing, doors, anchorage and other components
 1. Wind load design pressures based on Building Codes as listed in Construction documents.
 - a. Inward: Refer to Structural Drawings.
 - b. Outward: Refer to Structural Drawings.
 2. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.24 psf (300 Pa), as tested in accordance with ASTM E283.
 3. Water infiltration shall be tested in accordance with ASTM E 331, with no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
 4. Uniform load testing shall comply with ASTM E330.
 - a. A static air design load of 20 psf (958 Pa) shall be applied in the positive and negative direction without deflection in excess of L/175 of the span of any framing member.
 - b. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
 5. Thermal transmittance (U-factor), when tested to AAMA Specification 1503, shall not be more than:
 - a. Glass to exterior: 0.47 [or project-specific] BTU/hr/ft²/°F.
 - b. Glass to center: 0.44 [or project-specific] BTU/hr/ft²/°F.
 - c. Glass to interior: 0.41 [or project-specific] BTU/hr/ft²/°F.
 - d. Aluminum-framed flush doors: 0.48 [or project-specific] BTU/hr/ft²/°F.
 6. The Condensation Resistance Factor (CRF), when tested to AAMA Specification 1503, shall not be less than:
 - a. Glass to exterior – 70 frame and 69 glass.
 - b. Glass to center – 62 frame and 68 glass.
 - c. Glass to interior – 56 frame and 67 glass.
 - d. Aluminum-framed flush doors: 48.
 7. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC) of glazed units, when tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:
 - a. Glass to exterior: 38 (STC) and 31 (OITC).
 - b. Glass to center: 37 (STC) and 30 (OITC).
 - c. Glass to interior: 38 (STC) and 30 (OITC).

CHASE

SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

- 8. Windborne debris impact resistance shall be tested in accordance with ASTM E 1886 and ASTM E 1996 and/or AAMA 506.
 - a. Large-missile impact for Aluminum-framed systems located within 30 feet (9.1 m) of grade.
 - b. Small-missile impact for Aluminum-framed systems located more than 30 feet (9.1 m) above grade.
- D. Storefront framing system shall accommodate expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12-hour period without causing detrimental effect to system components, anchorages, and other building elements.
- E. Storefront framing system installation tolerance shall accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- F. Storefront framing system shall include a weep drainage network to direct to the exterior any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

1.5 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Submit the following to Architect of Record for review and approval
 - 1. Manufacturer's product data sheets including construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum frame storefront system and flush door indicated.
 - 2. Shop drawings including plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.
 - 3. Design data including framing member structural and physical characteristics, engineering calculations, dimensional limitations.
 - 4. Material samples
 - a. Storefront framing system: two of each profile required, 6" length.
 - b. Two 12"x12" glass, two of each type.
 - c. Two 12"x12" metal infill panel, two of each type.
 - d. Two 12"x12" flush door corner.
 - e. Glazing gasketing and similar accessories: two of each type, 6" length.
 - 5. Manufacturer's certificate indicating that the products supplied meet or exceed the specified requirements.
 - 6. Jurisdictional approvals as applicable
- C. Closeout submittals
 - 1. Report of field testing for water leakage.
 - 2. Manufacturer's warranty with forms completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Installer shall have had successful experience with installation of the same or similar units required for the project at other projects of similar size and scope.
- B. Manufacturer shall be capable of fabricating Aluminum storefront framing systems and flush doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports and calculations.
- C. Obtain Aluminum storefront framing systems and flush doors through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and flush doors and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
- E. Do not modify intended aesthetic effects, as judged solely by Architect of Record, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 PRE-INSTALLATION MEETING

- A. Convene pre-installation meeting with Architect of Record, General Contractor and fenestration installer one week before starting work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
- C. Upon receipt of materials, installer shall examine the shipment for damage and completeness.
- D. Store materials in a clean, dry location, out of direct sunlight.
- E. Stack all materials to prevent damage and to allow for adequate ventilation.

1.9 PROJECT CONDITIONS

- A. Verify actual dimensions of Aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on shop drawings.
- B. Coordinate the work with installation of firestopping components or materials.
- C. Install sealants within sealant manufacturer's required temperature and humidity conditions range. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five-year period after Date of Substantial Completion.
- C. Provide 10-year manufacturer warranty against degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Basis-of-design product:
 - 1. Manufacturer: Kawneer Company Inc.; www.kawneer.com.
 - a. Exterior storefront framing system: Trifab® VG 451T, 2" x 4 1/2" extruded Aluminum framing, center-glazed, thermally broken with a 1/4" (6.4 mm) urethane separation mechanically and adhesively joined to Aluminum, designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
 - b. Interior storefront partition system: Trifab® VG 451, 2" x 4 1/2" extruded Aluminum framing, center-glazed.
 - c. Entrance, Vestibule and exterior Employee Access doors: 500 Standard series; 1-3/4" thick, 5" top rails, 5" vertical stiles, 10" non-standard bottom rails, square glazing stops; match storefront framing finish.
 - d. Interior Employee Access doors: 190 Standard series; 1-3/4" thick, 2-1/4" top rails, 2-1/8" vertical stiles, 10" non-standard bottom rails, square glazing stops; match storefront framing finish.
 - e. Flush exterior doors ("Egress"): Flushline®; door face sheet shall be 0.062" (1.6 mm) Architectural quality 5005 alloy aluminum sheet, plain unpatterned.
- B. Substitutions: refer to Section 016000. Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.
 - 1. U.S. Aluminum, C.R. Lawrence Co.; www.crlawrence.com.
 - 2. Efco Corporation; www.efcocorp.com.
 - 3. Arcadia, Inc.; www.arcadiainc.com.

2.2 MATERIALS

- A. Aluminum extrusions shall be alloy and temper recommended by Aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.
 - 1. Exterior fenestration framing shall include thermal break with a 1/4" (6.4 mm) high-density polyurethane separation mechanically and adhesively joined to Aluminum, designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
 - 2. Finish shall be Class I AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
 - 3. Glazing stops shall be flush.
- B. Fasteners shall be Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
- C. Anchors, clips, and other attachment accessories shall be Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating. Provide fasteners of sufficient strength to withstand design pressure indicated.
- D. Reinforcing members shall be Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating. Provide fasteners of sufficient strength to withstand design pressure indicated.
- E. For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement. Refer to Section 079200 – Sealants.

2.3 HARDWARE

- A. Door hardware shall be as specified in the Door Hardware schedule in the construction drawings. Refer to Section 087100 – Door Hardware.
- B. Door sweeps shall be included at all exterior storefront system doors as indicated in the Door Hardware Schedule in the construction drawings. Refer to Section 08700 – Door Hardware.

2.4 GLAZING SYSTEMS

- A. Glazing shall be as specified in Section 088000 – Glazing.
- B. Glazing gaskets shall be storefront framing system manufacturer's standard replaceable, extruded EPDM rubber compression type.
- C. Spacers and setting blocks shall be elastomeric type.
- D. Bond-breaker tape shall be TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Weatherseal sealant shall be ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with other system components with which it comes in contact; as recommended by and Aluminum storefront framing system manufacturer for this use, color to match adjacent finish material when exposed to view.

2.5 FABRICATION

- A. Fabricate framing components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fit joints; make joints flush, hairline and weatherproof.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system 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.
 - 6. Provisions for field replacement of glazing.

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7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- B. Fabricate storefront framing components for assembly using manufactures standard installation instructions.
- C. After fabrication, clearly mark components to identify their locations in project according to shop drawings.
- D. Fabricate aluminum-framed flush entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- E. Flush doors
 1. Corner construction shall consist of mitered corners with angle alignment blocks secured with 3/8" full-width galvanized steel tie rods. Accurately fit and secure joints and corners. Make joints hairline in appearance.
 2. Face sheets shall lap and interlock with stile and rails to create a hollow cavity for the froth-in-place urethane core.
 3. Prepare components with internal reinforcement for door hardware.
 4. Arrange fasteners and attachments to conceal from view.
 5. Provide weather stripping locked into extruded grooves in door panels or frames as indicated on manufactures drawings and details.
- F. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- G. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- H. Prepare components to receive anchor devices. Fabricate anchors.
- I. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- J. Arrange fasteners and attachments to conceal from view.
- K. Reinforce components internally for door hardware.
- L. Reinforce framing members for imposed loads.
- M. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.
 1. Masonry surfaces must be visibly dry and free of excess mortar, sand, and other construction debris.
 2. Frame Walls must be dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that fastener heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
 3. Metal surfaces must be dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Comply with construction drawings, shop drawings, and manufacturer's written instructions for installing aluminum framed storefront system, flush doors, accessories, and other components.

CHASE

SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

- C. Install aluminum framed storefront system and flush doors 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.
- D. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- E. Install aluminum framed storefront system, doors and components to drain condensation, water penetrating joints, and moisture migrating within sliding door 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. Attach storefront framing members to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- H. Provide alignment attachments and shims to permanently fasten system to building structure.
- I. Provide thermal isolation where components penetrate or disrupt building insulation.
- J. Install sill flashings. Turn up ends and edges; seal to adjacent work to form watertight dam.
- K. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- L. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- M. Install hardware using templates provided. See Section 087100 for hardware installation requirements.
- N. Install glass in accordance with Section 088000, using glazing method required to achieve performance criteria.
- O. Install perimeter sealant in accordance with Section 079200.

3.3 ERECTION TOLERANCES

- A. Maximum variation from plumb shall be 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum misalignment of two adjoining members abutting in plane shall be 1/32".

3.4 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.5 CLEANING AND PROTECTION

- A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Remove protective material from pre-finished aluminum surfaces.
- E. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- F. Protect finished work from damage.

END OF SECTION

SECTION 084413 GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 Related Documents

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

1.2 Summary

- A. Section Includes: Kawneer Architectural Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.
- B. Related Sections.
- 072700 "Air Barriers".
 - 079200 "Joint Sealants".
 - 084113 "Aluminum-Framed Entrances and Storefronts".
 - 088000 "Glazing".

1.3 Definitions

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 Performance Requirements

- A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads. Failure also includes the following.
 - Thermal stresses transferring to building structure.
 - Glass breakage.
 - Loosening or weakening of fasteners, attachments, and other components.
 - Failure of operating units.
- B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind load design pressures based on Building Codes as listed in Construction Documents. Refer to Structural Drawings.
- D. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.2 psf (300 Pa).
- E. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
- F. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.
- G. Uniform Load: A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
- H. Seismic: When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 x the story height and ultimate displacement (inelastic) of 1.5 x the design displacement.
- I. Energy Efficiency:
- Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.57 (clear glass) or Project Specific.
- J. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 68_{frame} and 59_{glass} (clear glass).
- K. Energy Efficiency:
- Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.36 (HP glass) or Project Specific.

- L. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 75_{frame} and 72_{glass} (HP glass).
or
Condensation Index (I): when tested to CSA-A440-00, the Condensation Index shall not be less than 65_{frame} and 62.2_{glass} (HP glass).
- M. Sound Transmission Loss: When tested to ASTM E90, the Sound Transmission Class (STC) shall not be less than 31 and the outdoor-indoor transmission class (OITC) shall not be less than 25 based upon 1" (25.4) insulating glass (1/4" annealed, 1/2" argon, 1/4" annealed).
- N. Windborne-Debris-Impact-Resistance Performance: Shall be tested in accordance with ASTM E 1886 and information in ASTM E 1996 and TAS 201/203.
 - 1. Large – Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.
 - 2. Small – Missile Impact: For aluminum-framed systems located above 30 feet (9.1 m) of grade.
- O. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.
- P. Material Ingredient Reporting: Shall have a complete list of chemical ingredients to at least 100ppm (0.01%) that covers 100% of the product, acceptable documentation includes:
 - 1. Manufacturer's inventory with Chemical Abstract Service Registration Number (CASRN or CAS#).
 - a. Kawneer's Material Transparency Summary (MTS).
 - 2. Cradle to Cradle certification: Either document below is acceptable for this option.
 - a. Cradle to Cradle Certified™ with Material Health section Silver or above.
 - b. Silver Level or above Material Health Certificate.
 - 3. Red List Free DECLARE label.

1.5 Submittals

- A. See Section 013000 for submittal procedures.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 1. Environmental Product Declaration (EPD).
 - a. Include a Type III Product-Specific EPD created from a Product Category Rule.
 - 2. Material Ingredient Reporting:
 - a. Include documentation for material reporting that has a complete list of chemical ingredients to at least 100ppm (0.01%) that covers 100% of the product.
- C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.
- G. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following.
 - 1. Joinery.
 - a. Glazing.

1.6 Quality Assurance

- A. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.
- B. Installer Qualifications: Company specializing in installing aluminum glazing systems with minimum three years of documented experience.
- C. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed performance requirements.
- D. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.
- 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 modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

Laws and building and safety codes governing the design and use of glazed necessary for product improvement.
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- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.7 Project Conditions

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 Warranty

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 - PRODUCTS

2.1 Manufacturers

- A. Basis-of-Design Product.
1. Kawneer Company Inc..
 2. 1600 Wall System™2 Curtain Wall.
 - a. Frame depth options: 2-1/2" x 10-1/2"
 - b. Custom fin profile: 808-173
 - c. 90 degree outside corner.
 3. Tested to AAMA 501, ASTM E 1886, E 1996 and TAS 201, 202, 203.
 4. Finish: Kynar 500 Class I natural anodized.
 5. Color: Clear anodized. AAMA 611 AA-M12C22A41 clear anodic coating not less than 0.7 mils thick.
- B. Substitutions: Refer to Section 016000.

2.2 Materials

- A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.78) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.
- B. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.
- C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- E. Pressure Plate: Pressure plate shall be aluminum and fastened to the mullion with stainless steel screws.
- F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- G. Sealant: For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- H. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides a minimum 1/4" (6.3) separation.
- I. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.
- J. Red List Free: All parts and materials comply with the Living Building Challenge/DECLARE Red List and the Cradle-to-Cradle (C2C) Banned List.
1. PVC free.
 2. Neoprene free.
- OR
- K. Red List Free: Product does not contain PVC or Neoprene.

2.3 Curtain Wall Framing

- A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Glazing System: Structural silicone glazed (SSG).
 2. Glazing Plane: Front.

- B. Glass: 1" (25.4) and 1-5/16" (33.3) insulating glass option. 1/4" (6.3) or 1" (25.4) for Spandrel applications.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Framing Sealants: Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.
- E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
- F. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- G. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- H. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle curtain wall material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after installation.

2.4 Glazing

- A. Glazing: Comply with Division 08 Section "Glazing". Following glazing option is available.
 - 1. 1600 Wall System™2 Curtain Wall: Outside glazed, structural silicone glazed (SSG) format with 1" (25.4) insulating glass.
- B. Glazing Gaskets: Gaskets to meet the requirements of ASTM C864.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- E. Glazing Sealants: As recommended by manufacturer for joint type.

2.5 Accessory Materials

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.

2.6 Fabrication

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics.
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
 - 7. Internal weeping system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- C. Curtain Wall Framing: Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.
- D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 - EXECUTION

3.1 Examination

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

3.2 Installation

- A. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
 - 1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
 - 2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" (228.6) on center.
 - 3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

Laws and building and safety codes governing the design and use of glazed necessary for product improvement.
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- B. Related Products Installation Requirements.
 - 1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
 - 2. Glass: Refer to Glass and Glazing Section.
 - a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.3 Field Quality Control

- A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.
 - 1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
 - a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², which ever is greater.
 - b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).
- B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 Adjusting, Cleaning and Protection

- A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084413

CHASE
SECTION 087100 – DOOR HARDWARE

PART 1 - PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Door hardware and other items as indicated in the drawings, including but not limited to all items in the Door Hardware Schedule in the drawings.
- B. All items specified or otherwise necessary to complete the work of this Section and Related Sections.
- C. "Finish Hardware", including all items which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame. Extent of finish hardware required is indicated in schedules and elsewhere in the drawings.

1.2 RELATED SECTIONS

- A. The following sections of this specification should be examined in order to identify materials or equipment which may be obtained through this section:
 - 1. 081113 – Hollow Metal Doors and Frames
 - 2. 081416 – Flush Wood Doors
 - 3. 084113 – Aluminum-Framed Entrances and Storefronts
 - 4. 064116 – Plastic Laminate Clad Architectural Woodwork (cabinet hardware and locks)

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. ANSI A117.1: Accessible and Usable Buildings and Facilities; latest edition.
- B. American National Standards Institute, Inc. (ANSI) / Builders Hardware Manufacturers Association, Inc. (BHMA)
 - 1. Hinges ANSI/BHMA A156.1, latest edition; Grade 1
 - 2. Cylinder locks, latches and associated trim ANSI/BHMA A156.2, latest edition; Grade 1
 - 3. Exit devices ANSI/BHMA A156.3, latest edition; Grade 1
 - 4. Door controls - closers ANSI/BHMA A156.4, latest edition; Grade 1
 - 5. Cylinders and input devices for locks ANSI/BHMA A156.5, latest edition; Grade 1
 - 6. Architectural door trim ANSI/BHMA A156.6, latest edition
 - 7. Template hinge dimensions ANSI/BHMA A156.7, latest edition
 - 8. Door controls - overhead stops and holders ANSI/BHMA A156.8, Grade 1
 - 9. Power-operated doors ANSI/BHMA A156.10, latest edition
 - 10. Mortise locks and latches ANSI/BHMA A156.13, latest edition; Grade 1
 - 11. Pivots ANSI/BHMA A156.17, latest edition; Grade 1
 - 12. General materials and finishes ANSI/BHMA A156.18, latest edition
 - 13. Thresholds ANSI/BHMA A156.21, latest edition; Grade 1
 - 14. Door gasketing and edge seal systems ANSI/BHMA A156.22, latest edition; Grade 1
 - 15. Electromagnetic locks ANSI/BHMA A156.23, latest edition; Grade 1
 - 16. Electrified Locking Devices ANSI/BHMA A156.25, latest edition; Grade 1
 - 17. Continuous hinges ANSI/BHMA A156.26, latest edition; Grade 1
 - 18. Alarms for exit devices ANSI/BHMA A156.29, latest edition; Grade 1
 - 19. Electric strikes and frame mounted actuators ANSI/BHMA A156.31, latest edition; Grade 1
 - 20. Auxiliary locks ANSI/BHMA A156.36, latest edition; Grade 1
- C. National Fire Prevention Association (NFPA)
 - 1. NFPA 80: Standard For Fire Doors and Other Opening Protectives; latest edition.
 - 2. NFPA 101: Life Safety Code; latest edition.
- D. Underwriters Laboratories (UL)
 - 1. UL 14C: Swinging Hardware for Standard Tin-Clad Fire Doors Mounted Singly and in Pairs; latest edition.
 - 2. Building Materials Directory; latest edition.
 - 3. Accident Equipment List - Panic Hardware; latest edition.
- E. American Society for Testing and Materials International (ASTM)

CHASE
SECTION 087100 – DOOR HARDWARE

1. ASTM E283: Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; latest edition.
- F. American National Standards Institute, Inc. (ANSI) / Steel Door Institute (SDI)
- G. ANSI/SDI A250.8: Recommended Specifications for Standard Steel Doors and Frames; latest edition.
- H. Door and Hardware Institute (DHI)
 1. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; latest edition.
 2. Recommended Locations for Architectural Hardware for Flush Wood Doors; latest edition.

1.4 SUBMITTALS

- A. See section 013000 for submittal procedures.
- B. After the award of a formal contract, six (6) completed typewritten copies of the proposed Finish Hardware Schedule shall be submitted to the Architect of Record for approval. This schedule shall be prepared using the "Sequence and Format for the Hardware Schedule" as approved and recommended by the Door and Hardware Institute (DHI). After approval of the schedule, the Hardware Supplier shall provide two (2) copies of the approved schedule to the Architect of Record for file and distribution purposes.
- C. When submitting schedules for approval, include three (3) sets of manufacturers' cut sheets on hardware item proposed.
- D. Provide Architect of Record with hardware manufacturers' statements of compliance with ANSI/BHMA standards as noted in the References article of this Section.
- E. Templates: The Hardware Supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order to cut, reinforce, or otherwise prepare their material or product to receive the hardware item. In the event that physical hardware is required by any manufacturer, the Hardware Supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in execution of their work.
- F. Closeout submittals
 1. Manufacturer warranty cards for all installed hardware, with limits as indicated in the Products article.
 2. Maintenance and care instructions for all installed mechanical hardware.
 3. Finish maintenance and care instructions for all installed hardware.
 4. All special adjusting and/or installation tools furnished with the hardware by the manufacturer.

1.5 QUALITY ASSURANCE

- A. Hardware has been specified in the drawing schedules by manufacturers' name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function.
- B. To ensure a uniform basis of acceptable materials, it is the intention that only manufacturers' items specified as "Acceptable and Approved" be furnished for use on this project. Deviation from, or modification of items will be permitted only for the special instances caused by reason of construction characteristics and for the purpose of providing proper operational function. The Contractor shall be responsible for checking any necessary deviation in order to assure that the hardware shall fit and function properly.
- C. Substitutions: Request for substitution of hardware items listed as "Acceptable and Approved" shall be made to the Architect no later than ten (10) days prior to bid opening. Approval of substitutions will only be made in writing or by addendum. Requests for substitutions shall be accompanied by samples and/or detailed information clearly showing pertinent data for the proposed manufacturers' product(s).
- D. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than five (5) years, and who is or has in employment an Architectural Hardware Consultant (AHC) in good standing as certified by the Door and Hardware Institute or equivalent. This consultant shall have experience in the preparation of Architectural hardware specifications, estimating, detailing, ordering, and servicing of Architectural hardware and will be

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available at reasonable times during the course of the work for hardware consultation with the Owner, Architect and Contractor.

1.6 DELIVERY, STORAGE AND HANDLING

- A. All items of hardware to be delivered to the job site shall be completely packaged in manufacturer's unopened packaging with all necessary screws, bolts, miscellaneous parts, instructions, and where necessary, installation templates for manufacturers' suggested installation. They are to be clearly labeled so as to conveniently identify them and their intended location in the building.
- B. A representative of the General Contractor shall receive the hardware when delivered at the job site. Store hardware in a dry, locked room.
- C. Finish hardware shall be delivered to the General Contractor at the project site by the hardware vendor or door hardware installer. Direct factory shipments to the job site are not acceptable.
- D. Items damaged prior to acceptance by General Contractor shall be replaced promptly with proper material, and without additional cost to the General Contractor.
- E. All hardware shall be handled in a manner to minimize marring, scratching, or damage.

1.7 WARRANTY

- A. Minimum manufacturer warranty periods against material and workmanship shall be as follows, from date of Substantial completion of the project
 - 1. Finishes: match product warranty.
 - 2. Automatic door operators: 2 years.
 - 3. Locksets, latchsets and panic hardware: 3 years.
 - 4. Electromechanical locksets: 1 year.
 - 5. Closers and continuous hinges: 10 years.
 - 6. Butt hinges: Lifetime
 - 7. Pivots: 1 year
 - 8. Other mechanical hardware: 1 year.
 - 9. Thresholds: 5 years
 - 10. Non-mechanical hardware: 1 year.
- B. Hardware installer labor warranty shall be as indicated in Section 007200 – General Conditions or as supplemented or modified in section 007300 – Supplementary Conditions.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Material and finish requirements
 - 1. Finish hardware in this section shall meet the minimum ANSI/BHMA Grade standards as indicated in the References article of this Section.
 - 2. Product tests are to be administered by the ETL Testing Laboratories, Inc., Underwriters Laboratories, or other official testing laboratories which have been designated by BHMA for the testing of ANSI standards.
- B. Fire-resistance-rated and egress hardware labeling requirements
 - 1. Hardware which is to be installed in or on fire-resistance-rated doors and frames shall be tested, listed and labeled as compliant by Underwriters Laboratories or Warnock Hersey Laboratories.
 - 2. Exit devices used as 'panic hardware' shall be tested, listed and labeled as compliant in Underwriters Laboratories "Accident Equipment List - Panic Hardware".
 - 3. All listed hardware shall be in compliance with NFPA 80 and be properly stamped or labeled for easy identification.

2.2 MANUFACTURERS

- A. Requirements for design, grade, function, finish, size, and other distinctive characteristics of each type of hardware are indicated in the Door Hardware Schedule in the drawings.

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2.3 FINISHES

- A. Finish of hardware items shall be as listed in the Door Hardware Schedule in the drawings and shall conform to ANSI/BHMA A156.18 unless otherwise noted.

2.4 KEYING

- A. All locks and cylinders are to be core type, provided by the hardware supplier with keyed-alike construction cores. Permanent Master-keyed cores shall be provided by the Owner and installed at substantial project completion by the Owner. Hardware supplier shall provide 10 Construction Keys total.

2.5 HINGES

- A. Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template hinges which conform to ANSI/BHMA A156.7.
- B. All butt hinges shall be ball-bearing type unless otherwise noted.
- C. All exterior door butt hinges shall be stainless steel unless otherwise noted.
- D. Hinge pins shall match hinge leaf material
 - 1. For exterior doors, provide non-removable pins.
 - 2. For interior doors, provide non-rising pins.
 - 3. Hinge pin tips shall be flat button with matching plug, finished to match leaves.
- E. Hinge sizes
 - 1. Doors up to 36" wide: 4 1/2" x 4 1/2".
 - 2. Doors over 36" wide: 5" x 4 1/2".
- F. Hinge quantities
 - 1. Doors up to 7'-6" tall: 1 1/2" pair.
 - 2. Doors over 7'-6" tall: 2 pair.
- G. When projection of door trim is such as to prevent desired degree of opening, modify the hinge width specification as required to prevent the door or hardware from contacting the trim.
- H. Manufacturers
 - 1. As indicated in the Door Hardware Schedule in the drawings.
 - 2. Stanley.
 - 3. Bommer.
 - 4. Ives.
 - 5. Substitutions: not permitted.

2.6 LOCKSETS AND LATCHSETS

- A. All latches and locks shall be manufactured by a sole source.
- B. Mechanical locksets for this project shall be cylindrical type with lever handle trim as specified.
- C. The lockset case shall be manufacturer's standard wrought steel with zinc dichromate finish.
- D. Strikes shall be curved lip stainless steel ANSI Standard A115.1, 4-7/8"x1-1/4". Provide straight lip strikes, 7/8" lip to center, at pairs of doors.
- E. Provide cylinders with keyed-alike construction cores to be replaced by the Owner's Locksmith.
- F. At push-button locksets, provide concealed emergency override cylinders with keyed-alike construction cores. as specified in the hardware sets at the end of this section. Locks to be provided with override cylinder cores. Permanent cores to be furnished by Owner.
- G. Manufacturers
 - 1. As indicated in the Door Hardware Schedule in the drawings.
 - 2. Substitutions: not permitted.

2.7 EXIT DEVICES

- A. All exit devices ('panic bars') for this project shall have the chassis, end cap, and horizontal mounting rail, mounted directly to, and flush with, the door surface. No gaps or space shall be permitted

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between the back of the horizontal mounting rail and the door surface. If required, a continuous solid spacer bar shall be used to fill the space between the back of the device and the door surface.

- B. Manufacturers
 - 1. As indicated in the Door Hardware Schedule in the drawings.
 - 2. Substitutions: not permitted.

2.8 DOOR CLOSERS

- A. All door closers for this project shall be manufactured by a sole source.
- B. Physical and functional characteristics
 - 1. Cast iron case
 - 2. Rack-and-pinion type construction.
 - 3. Adjustable opening force and closing speed compliant with ANSI A117.1.
 - 4. Adjustable backcheck and/or delayed action.
 - 5. Heavy-duty heat-treated steel spindle.
- C. Door closers shall be installed such that they may be adjusted so as to comply with ANSI A117.1 requirements for closing speed and opening force.
- D. Provide thru-bolts for fire-rated doors which do not have closer blockings.
- E. All door closers shall be listed by Underwriters Laboratories for use on self-closing fire-resistance-rated doors.
- F. Manufacturer
 - 1. As indicated in the Door Hardware Schedule in the drawings.
 - 2. Substitutions: not permitted.

2.9 STOPS

- A. Stops shall be provided for all doors, including doors with closers, as indicated in the Door Hardware Schedule in the drawings.
- B. Stops shall be positioned so as to prevent contact of door and hardware with adjacent surfaces.
- C. Concealed overhead stops shall be used where specified, or where floor stops cannot be used. Where specified, provide overhead stops which incorporate field adjustability between 85 and 110 degrees of door opening. Plastic end caps at overhead stops are not acceptable.
- D. All stops to be fastened to concrete shall use expansion shields and machine screws.
- E. Stop types shall be as specified in the Door Hardware schedule in the drawings.
- F. Manufacturers
 - 1. As indicated in the Door Hardware Schedule in the drawings.
 - 2. Substitutions: not permitted.

2.10 KICKPLATES

- A. Kickplates shall be .050" beveled-edge stainless steel sheet, sizes and finishes as indicated in the Door Hardware Schedule in the drawings.
- B. Kickplates shall be applied on the push side of each door and on the pull side of doors where noted in the Door Hardware Schedule in the drawings.
- C. Manufacturers
 - 1. As indicated in the Door Hardware Schedule in the drawings.
 - 2. Hager.
 - 3. Rockwell.
 - 4. Substitutions: not permitted.

2.11 SEALS, WEATHERSTRIPPING, GASKETS, ETC.

- A. Weather seal materials shall be manufactured from nylon brush insert with all extruded aluminum retainer. Seals shall be designed to be installed on metal or wood door frames.
- B. Manufacturers

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1. As indicated in the Door Hardware Schedule in the drawings.
2. Zero.
3. Reese.
4. Substitutions: refer to Section 016000.

2.12 THRESHOLDS

- A. Provide thresholds as indicated in the Door Hardware Schedule and other details in the drawings, including at each exterior door.
- B. Thresholds shall be mill finish extruded Aluminum flat saddle type with thermal break, compliant with ANSI A117.1 accessibility requirements. Include machine screws with lead expansion shields for installation.
- C. Manufacturers
 1. As indicated in the Door Hardware Schedule in the drawings.
 2. Zero.
 3. Reese.
 4. Substitutions: refer to Section 016000.

2.13 DOOR SWEEPS

- A. Door sweeps shall be included at all exterior door leaves and Aluminum storefront system Vestibule doors, Employee Entrance doors and other similar doors.
- B. Manufacturers
 1. As indicated in the Door Hardware Schedule in the drawings.
 2. Substitutions: not permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify as-built conditions in field and modify specified types and quantities of hardware prior to submitting hardware schedule to Architect of Record for approval.

3.2 SEQUENCING

- A. Where hardware is to be installed onto or into unfinished materials, the hardware shall be fully installed to ensure proper fit, then removed and stored prior to painting or finishing. Re-install hardware components only after material finishes are complete, including full drying times of paints and other liquid-applied finishes.

3.3 INSTALLATION

- A. Mount hardware components at heights and backsets as indicated in "Recommended Locations for Builders Hardware" for Standard Steel Doors and Frames, Custom Steel Doors and Frames, Wood Doors and Frames by the Door and Hardware Institute (DHI), except as otherwise specifically indicated or to comply with authorities having jurisdiction, or as required for accessibility compliance.
- B. All hardware shall be installed by tradesmen skilled in the application of commercial grade hardware.
- C. Install each hardware item as indicated in the manufacturer's installation instructions.
 1. Securely fasten all parts to be attached.
 2. Fit faces of mortised parts snug and flush.
 3. All operating parts shall move freely and smoothly without binding, sticking or excessive clearance.
- D. Install hardware using fasteners provided or recommended by the hardware manufacturer. Self-drilling, self-tapping "TEK" screws are not to be used for any item of hardware unless packaged with hardware item by manufacturer.
- E. At exterior doors and elsewhere as indicated, set thresholds in a bed of thermal and moisture sealant to completely fill concealed voids. Do not plug drain holes or block weeps. Remove excess sealant. Refer to Section 079200 – Joint Sealants.

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3.4 ADJUSTING AND CLEANING

- A. Adjust and check each hardware component to ensure correct operation and function. Replace components which cannot be adjusted to operate as intended.
- B. Final adjustment: Hardware installer shall return to the project after the date of Substantial Completion and prior to final occupancy by the Owner during the Owner's period of Turnover from Real Estate to Retail to make final check and adjustment of all hardware items.
 - 1. Hardware shall be cleaned as necessary to restore correct operation, function, and finish.
 - 2. Door control devices shall be adjusted to compensate for the final operation of heating and ventilating equipment, and to comply with accessibility codes.
 - 3. Doors shall be adjusted to open fully as indicated in the floor plans or as otherwise noted.
 - 4. Door closers shall be adjusted to comply with ANSI A117.1 for closing speed and opening force.
 - a. Door closers shall be adjusted such that from an open position of 90 degrees, the time required to move the door to an open position of 12 degrees shall be 5 seconds minimum.
 - b. Exterior doors and fire doors shall have the minimum opening force permitted by the authority having jurisdiction.
 - c. Interior hinged doors other than fire doors, and interior sliding or folding doors shall be adjusted to a maximum opening force of 5 pounds.

3.5 PROTECTION

- A. Hardware located in areas where it may be subject to damage during construction by handling, cleaning, etc., (i.e., painting, cleaning of bricks) shall be protected and/or removed from its location until the deleterious activities are complete.

END OF SECTION

CHASE
SECTION 088000 – GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Work included: The Contractor shall furnish and install all glass and glazing work shown, noted or indicated on the drawings and/or specified herein and not specified as a part of other Sections, including all materials, labor, equipment and services necessary for the provision and proper installation of the work required. The work of this section includes, but is not limited to:
 - 1. Glass.
 - a. Building fenestration
 - b. Interior partitions
 - 2. Specialty glass products.
 - a. Glass partition systems, including rails, channels, clips and miscellaneous mounting and finish hardware.
 - b. Decorative applique films.
 - 3. Glass door hardware.
 - 4. Glazing sealants.
 - 5. Glazing gaskets and tapes.
 - 6. Miscellaneous glazing materials.
- B. Work excluded: The contractor shall refer to the specifications and other resources for information relative to conditions, which may affect his work.

1.2 RELATED SECTIONS

- A. 017800 - Closeout Submittals
- B. 062000 – Finish Carpentry
- C. 079200 – Joint Sealants
- D. 087100 – Door Hardware
- E. 084113 – Aluminum-Framed Entrances and Storefronts
- F. 088700 – Glazing Surface Films
- G. 102219 – Demountable Partition System

1.3 REFERENCES

- A. American National Standards Institute (ANSI); latest edition unless otherwise noted
 - 1. ANSI Z97.1: *American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.*
- B. American Architectural Manufacturers Association, latest edition unless otherwise noted
 - 1. AAMA CW-10: *Care and Handling of Architectural Aluminum From Shop to Site*; American Architectural Manufacturers Association.
- C. American Society for Testing and Materials International (ASTM); latest edition unless otherwise noted
 - 1. ASTM C 1036: *Standard Specification for Flat Glass.*
 - 2. ASTM C1048: *Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.*
 - 3. ASTM E773: *Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.*
 - 4. ASTM E774: *Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.*
 - 5. ASTM E1300: *Standard Practice for Determining Load Resistance of Glass in Buildings.*
- D. U.S. Consumer Product Safety Commission (CPSC)
 - 1. 16CFR 1201: *Safety Standard for Architectural Glazing Materials.*
- E. Glass Association of North America (GANA) ; latest edition unless otherwise noted
 - 1. GANA GM: *Glazing Manual*; Glass Association of North America.

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2. GANA SM: *FGMA Sealant Manual*.
3. GANA #89-1-6, Section 4.1: *Specification for Environmental Durability of Fully Tempered or Heat-Strengthened Spandrel Glass with Applied Opacifiers*.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Submit the following to Architect of Record for review and approval
 1. Manufacturer's product data sheets including construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of glass and glazing system indicated.
 2. Shop drawings of interior glass partitions including plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.
 3. Shop drawings of custom-fabricated and finished metal glazing clips, including dimensions, base and finish materials, and standard finish designations.
 4. Material samples, two of each type
 - a. Glass, 12"x12" including sealed insulating units.
 - b. Glazing rail, channel and similar material, 6" length each, including one end cap with each sample, with finish as indicated in the construction drawings.
 - c. Glazing gaskets, spacers and similar accessories, 6" length.
 5. Manufacturer's certificates for each material indicating that the products supplied meet or exceed the specified requirements.
 6. Jurisdictional approvals as applicable
- C. Closeout submittals
 1. Report of field testing for water leakage.
 2. Manufacturer's warranty with forms completed in Owner's name and registered with manufacturer.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass units and freestanding glass support systems, including comprehensive engineering analysis according to ASTM E 1300, shall be designed by a qualified professional engineer, using the following design loading criteria
 1. Design wind pressures and seismic loading as determined by authorities having jurisdiction.
 2. Maximum center-of-glass lateral deflection units supported on all four edges shall be limited to 1/200 times the short-side length or the flexure limit of the glass, whichever is less.
 3. Design glass to resist thermal stresses induced by differential shading within individual glass lites.
 4. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section at other projects of similar size and scope with minimum 5 years documented experience.
- B. Installer shall have had successful experience with installation of the same or similar units required for the project.
- C. Manufacturer shall be capable of fabricating glazing units that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports and calculations.
- D. Obtain glazing units through one source from a single manufacturer for each type.
- E. Drawings indicate specific size, profiles, and dimensional requirements of aluminum framed storefront system and flush doors. Refer to Division 01 Section – Product Requirements. Do not modify dimensional requirements.

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SECTION 088000 – GLAZING

- F. Do not modify intended aesthetic effects, as judged solely by Architect of Record, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 PRE-INSTALLATION MEETING

- A. Convene pre-installation meeting with Architect of Record, General Contractor and fenestration installer before starting work of this section, with adequate time to allow remaining preparation work at the site to complete.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Upon receipt of materials, installer shall examine the shipment for damage and completeness, including failure of insulated unit seals. Return damaged units for re-fabrication.
- C. Store materials in a clean, covered, dry location, out of direct sunlight.
- D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.9 PROJECT CONDITIONS

- A. Verify actual dimensions of Aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on shop drawings.
- B. Coordinate the work with installation of firestopping components or materials.
- C. Install sealants within sealant manufacturer's required temperature and humidity conditions range, and never less than 50 deg. F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

- A. Refer to Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide installer warranty covering correction of defective work within a five year period after Date of Substantial Completion. Warranty shall include seal failure, interpane dusting or misting, and replacement of same.

PART 2 - PRODUCTS

2.1 INSULATING EXTERIOR GLASS UNITS

- A. Physical and performance characteristics:
 - 1. 1" total thickness 2-pane assemblies, with glass pane thicknesses as determined by the manufacturer for the indicated span and loading.
 - 2. All units shall be Energy Star compliant, meeting the minimum thermal transmittance (U-Factor) and solar heat gain (SHGC) requirements for the project's climate zone indicated by the National Fenestration Rating Council (NFRC).
 - 3. Solar Heat Gain Coefficient (SHGC) shall be selected by the Architect or Engineer of Record as appropriate for the building's climate and exposure so as to allow the highest Visual Transmittance (VT) possible while minimizing negative effects on the building's environmental control equipment.
 - 4. All units shall include Low-E coating(s) at the interior surface(s). except spandrel glass units.
 - 5. Spacer bars shall be mill-finish or clear anodized Aluminum.
 - 6. Unit cavity shall be filled with Argon or Krypton gas.
 - 7. Units shall comply with ASTM E773 and E774.
- B. Where required by building code or authorities having jurisdiction, provide 'safety glass' complying with ASTM C1048, Kind FT and ANSI 97.1.
- C. Units designated as 'spandrel' shall be insulated units with spray-applied water-based silicone opaque coating applied to surface #3 (outward-facing surface of interior pane).
 - 1. ICD High-Performance Coatings Opaci-Coat 300 #3-0770 'Warm Gray'. For substitutions, refer to Section 016000.
 - 2. Units shall comply with GANA #89-1-6, Section 4.1.
 - 3. Spandrel units shall not receive Low-E coatings.

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SECTION 088000 – GLAZING

D. Manufacturers

1. AGC Glass Company North America, Inc.; www.us.agc.com.
2. PPG Industries, Inc.; www.ppg.com.
3. Pilkington (Nippon Sheet Glass Co., Ltd.); www.pilkington.com/en/us
4. Oldcastle; www.oldcastlebe.com/products/architectural-glass
5. Substitutions: refer to Section 016000.

2.2 INTERIOR CLEAR FLAT GLASS UNITS

- A. 1/2" thick clear annealed transparent flat float glass complying with ASTM C1036, Type I, Class 1, Quality Q3; used where not otherwise required by code to be 'safety' glass.
- B. Where required by building code or authorities having jurisdiction, provide 'safety glass' complying with ASTM C1048, Kind FT and ANSI 97.1.
- C. Manufacturers: as indicated for Insulating Exterior Glass Units.

2.3 INTERIOR DECORATIVE GLASS UNITS

- A. Obscured glass partition panels
 - a. 3/8" total thickness 2-lite low-iron transparent flat float glass complying with ASTM C1036, Type I, Class 1, Quality Q3; laminated with patterned adhesive sheet between the glass, pattern and color as indicated in the Interior Finish Materials Schedule in the Drawings. Assembly shall comply with CPSC 16CFR 1201 Category II and ANSI 97.1.
 - b. Where required by authorities having jurisdiction, provide tempered glass compliant with ASTM C1048.
 - c. Alternate: surface-applied glazing film over clear glass.
 - 1) Glazing film as indicated in the Interior Finish Materials Schedule in the Drawings.
 - 2) Clear glass panels as indicated in Section 2.2 Interior Clear Flat Glass Units above.
- B. Manufacturer
 1. As indicated in the Interior Finish Materials Schedule in the Drawings.
 2. Substitutions not permitted.

2.4 GLAZING MATERIALS

- A. Exterior glass units and interior glass units set in storefront framing.
 1. Gaskets, spacers, sealants and other glazing materials and accessories shall be as specified in 084113 – Aluminum-Framed Entrances and Storefronts.
- B. Interior glass units.
 1. Joint sealant shall be Type D – interior partition glazing adhesive (clear structural silicone adhesive) as specified in Section 079200 – Joint Sealants.
 2. Gaskets, spacers, and other glazing materials and accessories shall be as specified in the Interior Finish Materials Schedule in the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

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SECTION 088000 – GLAZING

- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.4 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.5 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.6 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

CHASE
SECTION 088700 – GLAZING SURFACE FILMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Field-applied anti-graffiti glazing films at exterior fenestration, for use by exception only as directed by the Owner.
- B. Field- and shop-applied decorative, obscuring and solar-control interior glazing films.

1.2 RELATED SECTIONS

- A. 017800 – Closeout Submittals
- B. 088000 – Glazing

1.3 REFERENCES

- A. American Society of Testing and Materials International (ASTM), latest edition unless noted otherwise.
 - 1. ASTM E84: Surface Burning Characteristics of Building Materials.
 - 2. ASTM E308: *Standard Practice for Computing the Colors of Objects by Using the CIE System*.
 - 3. ASTM E903: *Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres*.
- B. NFPA 101: *Life Safety Code*; National Fire Prevention Association; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Submit the following to Architect of Record for approval
 - 1. Product data sheet for each type of glazing surface film.
 - 2. Two samples for each type of glazing film applied to 12" x 12" glass panes.
- C. Closeout submittals, for each type of glazing surface film
 - 1. Manufacturer's warranty with forms completed in Owner's name and registered with manufacturer.
 - 2. One copy of manufacturer's maintenance / use / care instructions.

1.5 QUALITY ASSURANCE

- A. Glazing film shall be installed by personnel experienced in the field installation of glazing film of the type specified.
- B. Mock-up
 - 1. Mock-up not required for shop-applied interior glazing surface films.
 - 2. For exterior field-applied glazing film, install each type at a single glazed lite or interior partition panel as indicated by the Architect of Record.
 - 3. Mock-up shall be approved by the Architect of Record prior to proceeding with work.
 - 4. Approved mock-up may be incorporated into the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt of materials, installer shall examine the shipment for damage and completeness. Return damaged materials.
- B. Store materials in a clean, covered, dry location, out of direct sunlight.
- C. Stack all materials to prevent damage and to allow for adequate ventilation.

1.7 PROJECT CONDITIONS

- A. Field-application of glazing surface films shall be performed only under the following conditions:
 - 1. All types: after work of other dust-producing trades is complete or paused for surface cleaning and installation of glazing surface films.
 - 2. Exterior films: during environmental conditions acceptable to the glazing film manufacturer.

3. Interior films: After building mechanical systems are installed and operating, with control of Interior temperature and humidity meeting the requirements of the glazing surface film manufacturer.

1.8 WARRANTY

- A. Refer to Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide installer warranty covering correction of work found to be defective after Date of Substantial Completion for the following periods:
 1. Anti-graffiti film: 5 years.
 2. Interior opaqueing film: 5 years.
 3. Decorative glass partition film: 5years.
 4. Solar control film: 15 years.

PART 2 - PRODUCTS

2.1 EXTERIOR ANTI-GRAFFITI GLAZING FILM

- A. Product: Madico Graffiti Free LCL-600-XSRG; www.madico.com.
- B. Use: sacrificial barrier to protect glass from graffiti.
- C. Physical and performance properties: clear 6-mil self-adhesive polyester sheet with 83% visible light transmittance, 10% solar reflectance and 11% solar absorbance.
- D. Application: surface-applied to exterior faces of glass.
- E. Compliance requirements
 1. Tested for surface burning characteristics in accordance with ASTM E84.
 2. Rated 'Class A' under NFPA 101.
- F. Substitutions not permitted.

2.2 INTERIOR GLASS OPAQUEING FILM

- A. Product: refer to the Interior Finish Materials Schedule in the construction drawings.
- B. Use: Obscures visibility while maintaining translucence for security and modesty applications.
- C. Physical and performance properties: frosted self-adhesive sheet with 75% visible light transmittance, 69% solar transmittance, 20% solar reflectance and 11% solar absorbance.
- D. Application: surface-applied to interior faces of glass at storefront systems.
- E. Compliance requirements
 1. Tested for surface burning characteristics in accordance with ASTM E84.
 2. Rated 'Class A' under NFPA 101.
- F. Substitutions not permitted.

2.3 DECORATIVE INTERIOR GLASS PARTITION GLAZING FILM

- A. Product: refer to the Interior Finish Materials Schedule in the construction drawings.
- B. Use: Decorative surface-applied film as a substitute for laminated patterned glass interior partitions.
- C. Physical and performance properties: 3-mil patterned self-adhesive sheet with 65% visible light transmittance, 64% solar transmittance, 17% solar reflectance and 19% solar absorbance.
- D. Application: surface-applied to a single face of interior glass partition panels.
- E. Compliance requirements
 1. Tested for surface burning characteristics in accordance with ASTM E84.
 2. Rated 'Class A' under NFPA 101.
- F. Substitutions not permitted.

CHASE
SECTION 088700 – GLAZING SURFACE FILMS

2.4 SOLAR-CONTROL INTERIOR GLAZING FILM

- A. Manufacturer: 3M; www.3m.com/windowfilm.
- B. Product: Prestige series 2-mil clear self-adhesive sheet, specific product as determined necessary by Architect of Record to meet the building design requirements.
- C. Use: Surface-applied solar-control film installed at the interior face of storefront glazing by exception only as a directive from the Owner where required to reduce glare or heat gain.
- D. Physical properties
 - 1. Minimum visible light transmission per ASTM E903 and E308: 60%.
 - 2. Maximum exterior visible reflection per ASTM E903: 8%.
 - 3. Minimum UV rejected per ASTM E903: 99.9%.
 - 4. Minimum IR rejected per ASTM E903: 97%.
 - 5. Minimum luminous efficacy per ASTM E903: 1.10%.
 - 6. Minimum Shading Coefficient at 90 deg. per ASTM E903: 0.50.
 - 7. Minimum total solar energy rejected at 90 degrees per ASTM E903: Not less than 50%.
 - 8. Minimum total solar energy rejected at 60 degrees per ASTM E903: Not less than 59%.
- E. Substitutions: refer to Section 016000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass and surrounding adjacent surfaces for conditions affecting installation. Report conditions that may adversely effect installation. In report, include description of any glass that is broken, chipped, cracked, abraded, or damaged in any way.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Beginning of installation constitutes installer's acceptance of conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.
- C. Protect window frames and surrounding conditions from damage during installation.

3.3 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. For applications of sacrificial barrier films, use dilute detergent pretreatment as recommended by the manufacturer for release enhancement properties.
- B. Comply with glazing film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- C. Install film to each distinct pane as a single sheet, free of scratches, dirt, and imperfections.
- D. Accurately trim film even with glazing stops, pressure plate or glass edge for complete coverage of visible exterior surface.
- E. Provide straight and clean edge line where film is terminated within the field of a glass panel.
- F. Remove air bubbles, wrinkles, blisters, and other defects.
- G. Install opaqueing films to interior glass surfaces. Install graffiti film to exterior glass surfaces.
- H. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform with no visible streaks, banding, thin spots or pinholes. If installed film does not meet this criteria, remove and replace with new film.

CHASE
SECTION 088700 – GLAZING SURFACE FILMS

3.4 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.
- C. Remove labels after work is complete.
- D. Clean glass and adjacent surfaces. Use cleaning methods recommended by glazing film manufacturer.
- E. Replace films that cannot be cleaned.

END OF SECTION

CHASE
SECTION 092200 – LIGHT GAUGE METAL SUPPORT FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Partition framing.
 - 2. Steel backing.
 - 3. Ceiling and soffit framing.
 - 4. Furring.
- B. Related Sections:
 - 1. 054000 – Cold-Formed Metal Framing: Light Gauge Metal Framing indicated on the structural drawings.
 - 2. 055000 – Metal Fabrications: Partial height wall bracing.
 - 3. 061000 – Rough Carpentry: Wood blocking; framing and sheathing.
 - 4. 098100 – Acoustic Insulation: Insulation between framing members.
- C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.
- D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

- A. ASTM A 641 – Zinc-Coated Galvanized Carbon Steel Wire; current edition.
- B. ASTM C 635 – Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings; current edition.
- C. ASTM C 645 – Standard Specification for Nonstructural Steel Framing Members; current edition.
- D. ASTM C 754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; current edition.
- E. Underwriters Laboratories (UL): Standard 2079 - Tests for Fire Resistance of Building Joint Systems.

1.3 SYSTEM DESCRIPTION

- A. Structural Design:
 - 1. Select framing systems, gauges, supports, bracing, and connections as necessary to meet the structural requirements specified.
 - 2. Partition framing shall conform to the widths indicated, unless approved otherwise. Provide thicker gages and decreased stud spacing as necessary to meet the design requirements.
 - 3. Select framing members based on the manufacturer's published span tables.
- B. Design Loads:
 - 1. Interior Ceiling Assemblies: 5 pounds per square foot uniform live load, plus dead loads.
 - 2. Exterior Soffit Assemblies: 30 per square foot positive and negative uniform live load, plus dead loads.
 - 3. Interior Partitions without Wall Mounted Casework: 5 pounds per square foot uniform live lateral load.
 - 4. Interior Partitions with Wall Mounted Casework: 5 pounds per square foot uniform live lateral load, casework dead load, and casework live load of 25 pounds per square foot of shelf area.
 - 5. Seismic Loads: Conform to the requirements of currently enforced edition of the jurisdictional code authorities.
- C. Deflection Requirements:
 - 1. Maximum deflection of 1/240 for flexible finish materials such as gypsum board and veneer plaster.
 - 2. Maximum deflection of 1/360 for rigid finish materials including gypsum plaster, cement plaster, ceramic tile, maximum 3/8" thick stone tile, or mirrors.

CHASE

SECTION 092200 – LIGHT GAUGE METAL SUPPORT FRAMING

- D. Fire Rated Partition Head Assemblies:
 - 1. Successfully tested in accordance with ASTM E119, including hose stream test, to meet the hourly fire ratings of the construction being sealed.
 - 2. Successfully tested in accordance with the requirements of UL 2079, for dynamic movement.

1.4 SUBMITTALS

- A. Make submittals in accordance with Section 013300.
- B. Product Data: Submit complete published literature for framing systems and components. Include span tables for proposed framing systems.
- C. Shop Drawings: Indicate typical and special framing sections and details. Indicate fastening systems, gauges, framing spacing, bracing configurations and locations, anchorage to acoustical ceiling grid, metal backing, attachment to overhead structure, and similar conditions.
- D. Shop Drawings: Submit shop drawings for special overhead stud framed conditions. Indicate typical fastening systems, adjacent construction, gauges, framing spacing, bracing configurations, and locations.
- E. Quality Control Submittals:
 - 1. Certification: Submit certification that the overhead framing systems have been designed in accordance with the specified requirements.
- F. Closeout Submittal:
 - 1. In accordance with Section 017700.
 - 2. Submit design engineer's certification that products and installation comply with design requirements.

1.5 QUALITY ASSURANCE

- A. Unless indicated or specified otherwise, perform work in accordance with ASTM C754.
- B. Code Requirements:
 - 1. Provide assemblies meeting the hourly fire ratings indicated and specified. Assemblies shall be tested in accordance with ASTM E119, and shall be approved by the local jurisdictional code authorities. Coordinate installation of other materials which are a part each assembly.
 - 2. Fire rating requirements take precedence over the construction requirements indicated. In the event of conflict, notify the Architect, and do not begin construction in the area of conflict until the conflict has been resolved.
 - 3. Provide calculations, drawings, product data, and other verification as required by the jurisdictional code authority to obtain approval of the lightgauge metal framing installation.
- C. Structural Design: Framing systems shall be designed by a structural engineer licensed to practice in the state where the Project is located.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Non-Load Bearing Light Gauge Metal Framing:
 - 1. ASTM C645; galvanized; minimum 20 gauge unless indicated or specified otherwise.
 - 2. Furnish "C" shaped studs, depth as scheduled, with return lip and not less than 1-1/4 inch flanges; prepunched openings for the installation of stiffening channels and mechanical and electrical items.
 - 3. Furnish U shaped tracks (runners), hat and "Z" shaped furring channels, and other sizes and shapes as indicated on the Drawings, and required by the referenced standards.
 - 4. Gauges:
 - a. Furnish gages as necessary to meet deflection requirements, unless indicated or specified otherwise.
 - b. Top runner for partitions extending only to the acoustical ceiling grid shall be 20 gauge.
 - c. Provide minimum 20 gauge for full height partition framing extending from structure to structure.
 - d. Gypsum Board: As specified in Section 092900.

CHASE

SECTION 092200 – LIGHT GAUGE METAL SUPPORT FRAMING

- e. Insulation: As recommended by the assembly manufacturer.
- f. Fire Rated Compound: National Gypsum Company "Gold Bond STA-Smooth FS-90 Fire Shield Compound."
- B. Exterior Wind Load Bearing: Types as noted on the structural drawings.
- C. Channels: Hot or cold rolled channels; rust inhibitive paint coating; sizes in accordance with ASTM C754.
- D. Proprietary Ceiling Suspension System:
 - 1. Manufacturer:
 - a. Basis of Design: Chicago Metallic (Los Angeles CA; 800-323-7164).
 - b. Acceptable Options (subject to compliance with Contract Document requirements and Architect's approval of conformance to design intent):
 - 1) USG Interiors, Inc. (Chicago, IL; 800-874-4968).
 - 2) Armstrong (800-207-2321).
 - 2. Suspension System: Similar to System 650, or 670; ASTM C635 heavy duty classification.
 - a. Furring Runners: Manufactured from 0.020 inch thick steel 1-3/8 inch wide with knurled face by 1-1/2 inches high; factory punched cross tee slots, hanger holes, and non-directional bayonet end tab couplings.
 - b. Furring Tees: Manufactured from 0.020 inch thick 1-3/8 inch wide with knurled face by 1-1/2 inches high; factory punched cross tee slots and hanger holes.
 - c. Furring Cross Channel: 0.020 inch thick steel; 1-3/8 Inch wide with knurled face by 7/8 inches high by 48 inches long with straight locking end tabs.
 - d. Cross Tees: 0.020 inch thick steel 15/16 inch wide by 1-1/2 inches high; with staked-on dip end tab couplings, factory punched cross tee slots.
 - e. Moldings: Manufacturer's standard.
 - f. Channel beam splice clip: Manufacturer's standard.
- E. Accessories:
 - 1. Screws: Self tapping; low profile head; galvanized.
 - 2. Hanger wire: ASTM A641; Class 1 zinc coating; soft temper; pre-stretched; 12 gauge.
 - 3. Resilient Channels: USG "RC-1," or approved.
 - 4. Backing: Dietrich Industries (Pittsburgh PA, 412-281-2805; Renton WA, 425-251-1497) "Danback Flexible Wood Backing Plate."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- B. Do not begin work until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Steel Decking:
 - 1. Where fastening into bottom of steel decking is required, fasten only into lower flutes.
 - 2. Do not use fasteners in steel deck which penetrate more than 1 inch.
- B. Verify location of conduit in poured concrete construction before making attachments.

3.3 INTERIOR PARTITION FRAMING

- A. Runners:
 - 1. Secure runners with fasteners at maximum 24 inches on center.
 - 2. At concrete floors, use powder driven fasteners or drilled in concrete anchors.

CHASE

SECTION 092200 – LIGHT GAUGE METAL SUPPORT FRAMING

3. Top Runner: Secure head track to structure with allowance for structural deflection.
 - a. Non-Rated Partitions: Use proprietary compensating channel or deep leg track at Contractor's option, as necessary to accommodate building deflection.
 - b. Fire Rated Partitions: Install proprietary fire rated runner and accessories as necessary to meet the fire rating requirements indicated on the Drawings; comply with UL requirements for listed assembly.
4. Align to tolerances specified.
- B. Unless indicated otherwise, install studs vertically at 16 inches on center, and not more than 2 inches from abutting construction, at each side of openings, and at corners.
- C. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.
- D. Brace partition framing system and make rigid. Provide diagonal stud bracing at maximum 8 ft on center at framing which does not extend to structure.
- E. Install double studs continuous from floor to ceiling track at the jamb of each door frame and cased opening. Studs shall be no less than 20 gauge. Provide diagonal steel stud bracing to structure at each jamb at partitions which do not extent to structure.
- F. Install minimum 20-gauge studs at partitions indicated for support of modular wall-mounted casework.
- G. Where control joints are indicated in fire rated partitions, provide double stud and gypsum board backing or other tested assembly in accordance with manufacturer's recommendations or Warnock-Hersey WHI-651-0318-1. Coordinate with Section 092900.
- H. Coordinate erection of studs with installation of service utilities. Align stud web openings.
- I. Coordinate installation of bucks, anchors, blocking, electrical, and mechanical work to be placed in or behind stud framing.
- J. Coordinate erection of stud system with requirements of door and window frames, fire extinguisher cabinets, recessed toilet accessories, access doors, acoustical insulation, and other construction within partition.
- K. Coordinate the installation of framing with the gypsum board installer to ensure support at board edges. Provide framing immediately either side of expansion joints.
- L. Stud splicing not permissible.
- M. At non-load bearing full height partitions subject to compression caused by overhead structural deflection, and where proprietary compensating channel system is not used, cut studs 1/2 inch short from full height. Do not rigidly connect stud to top runner.
- N. Furring at Rigid Insulation:
 1. Space "Z" furring channels at a maximum of 24 inches on center, and no more than 3 inches from corners.
 2. Unless indicated otherwise, install framing vertically with fasteners at 24 inches on center. Provide shims as required to meet tolerance requirements specified. Anchor to concrete with powder driven fasteners spaced not more than 24 inches on center.
 3. Coordinate installation of framing to allow installation of rigid insulation as specified in another Section.
- O. Stud Bridging:
 1. At interior partitions greater than 4 feet in length, and with rigid facing material on one stud flange only, provide 3/4" bridging channels in horizontal rows at a maximum of 5'-0" on center for the full height of the partition.
 2. Interior full height partitions (studs extending from the floor to the structure above) with rigid facing material stopping 3'-0" or more below top of studs - Provide one row 3/4" bridging channel horizontally at termination of gypsum board material, and one additional row for each 5'-0" of exposed studs.
 3. Install stud bridging channels in long lengths, wire tying and lapping the joints a minimum of 12 inches. Attach bridging channel to each stud as shown in manufacturer's printed instructions.

CHASE

SECTION 092200 – LIGHT GAUGE METAL SUPPORT FRAMING

3.4 BACKING

- A. Provide steel or fire treated wood backing, unless indicated otherwise, for the support of wall mounted items.
- B. Unless indicated otherwise, steel backing shall consist of minimum 4-inch-wide 16 gauge steel plate screwed rigidly to the studs.

3.5 CEILING, SOFFIT, AND FASCIA FRAMING

- A. Coordinate locations of hangers and supports with the work of other Sections.
- B. Ceiling framing shall consist of stud and runner framing or suspended framing, unless indicated or specified otherwise.
- C. Stud and Runner Framing:
 - 1. Secure runners to structure above with fasteners at a maximum of 24 inches on center. Size fasteners and use reinforcements as necessary to support the dead loads applied.
 - 2. Screw fasten framing at each flange joint.
 - 3. Space studs at 16 inches on center at horizontal locations.
 - 4. Select members to meet the structural requirements specified.
- D. Lightgage Suspended Framing:
 - 1. Install in accordance with ASTM C754, unless indicated or specified otherwise.
 - 2. Suspend ceiling from overhead structural elements only. Do not support from any electrical, HVAC, plumbing, or sprinkler system components.
 - 3. Space carrying channels 4 feet on center with splices lapped 12 inches and tied.
 - 4. Support cold rolled carrying channels with hanger wires spaced at 3 feet on center for lath and plaster ceilings and 4 feet on center for gypsum board ceilings. Loop hanger wire around support element and tightly wrap around vertical wire 3 times; cut off neatly.
 - 5. Space furring channels 16 inch on center with splices lapped 12 inch, minimum and tied; clip or saddle tie to runner channels with 16-gauge tie wire.
 - 6. Where overhead obstructions prevent the regular spacing of hangers, provide secondary carrying members for indirect support of the suspension system, or reinforce the nearest adjacent hangers and related framing components as required to span the required distance.
- E. Stabilize suspended ceiling, soffit, and fascia framing against lateral movement by means of diagonal bracing. At locations where partitions extend to ceiling only, install supplementary bracing at maximum 8 feet on center along length of partition, and above each door hinge and strike jamb. Form openings in ceilings and frame openings for recessed light fixtures, air diffusers, access doors, hatches, etc.
- F. Install supplementary hanger wires for support of ceiling mounted equipment, such as speaker support bracket, as required and as detailed.

3.6 TOLERANCES

- A. Install members to provide surface plane with maximum variation of 1/8 inch in 10 feet in any direction.
- B. Locate assemblies within 1/4 inch of required locations.
- C. Locate framing on the center of the joint between gypsum board panels, within a tolerance of 1/4 inch.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products manufactured or shop-fabricated of glass fiber reinforced gypsum (GFRG), as indicated on the drawings.
- B. Hardware and accessories required for GFRG products installation.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry
- B. 079200 – Joint Sealants
- C. 092200 – Lightgage Metal Support Framing
- D. 092900 – Gypsum Board.
- E. 099100 – Paints

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 840 – Standard Specification for Application and Finishing of Gypsum Board; latest version.
 - 2. ASTM D 256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; latest version.
 - 3. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics; latest version.
 - 4. ASTM D 785 – Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials; latest version.
 - 5. ASTM D 790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; latest version.
 - 6. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials; latest version.

1.4 SUBMITTALS

- A. Refer to Section 013000 for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets on each product to be used, including dimensions, finishes, storage, handling and installation requirements and recommendations.
- C. Shop Drawings: Provide drawings showing dimensions, layout, joints, details, and interface with adjacent work; include field-measured dimensions of the spaces where items are to be installed, if critical to proper installation.
- D. Regulatory Requirements:
 - 1. For projects requiring the inclusion of products within this Section within fire resistance rated assemblies, submit manufacturer's documentation indicating compliance.
 - 2. Provide assemblies meeting the hourly fire ratings indicated and specified. Assemblies shall be approved by the local jurisdictional authorities.
 - 3. Fire rating requirements take precedence over the construction requirements indicated. In the event of conflict, notify the Architect, and do not begin construction in the area of conflict until the conflict has been resolved.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Transport, lift, and handle units with care, avoiding excessive stress and preventing damage; use appropriate equipment.
- B. Store products in manufacturer's unopened packaging until ready for installation, in a clean dry area protected from weather, moisture, and damage. Store units upright and not stacked unless permitted by manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A single manufacturer specializing in manufacturing the products specified in this section shall provide all GFRG components, and shall have a minimum of five years experience manufacturing these products.
- B. Installer qualifications.
 - 1. Employ skilled technicians who are experienced and knowledgeable in GFRG product installation application, and familiar with the requirements of the specified work.
 - 2. Successful completion of minimum of three projects of similar scope and complexity to the specified project.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Stromberg Architectural Products Inc, Greenville, Texas; www.strombergarchitectural.com.
- B. RWM Inc., Murray, Utah; www.rwm-inc.com.
- C. Formglas Products, Ltd., Ontario, Canada; www.formglas.com.
- D. DMI. Adelanto, California; www.dmi-victory.com.
- E. First Class Building Products, Marietta, Georgia; www.firstclassbp.com.
- F. Substitutions: refer to Section 016000.

2.2 MATERIALS

- A. Glass Fiber Reinforced Gypsum Fabrications: High density gypsum reinforced with continuous filament glass fiber mat and structural reinforcing as required.
 - 1. Glass Content: 5 to 6 percent by weight.
 - 2. Density: 103 to 112 pcf (1650 to 1795 kg/cu m).
 - 3. Shell Thickness: 1/8 to 3/16 inch (3 to 5 mm), nominal.
 - 4. Flame Spread Index: 0, when tested in accordance with ASTM E 84.
 - 5. Flexural Strength: 3200 to 4000 psi (22 to 27.5 MPa), when tested in accordance with ASTM D 790.
 - 6. Modulus of Elasticity: 2.1 to 2.2×10^5 psi (1450 to 1515 MPa), when tested in accordance with ASTM D 790.
 - 7. Tensile Strength: 1200 to 1400 psi (8.3 to 9.6 MPa), when tested in accordance with ASTM D 638.
 - 8. Impact Strength: 8.0 to 8.8 ft lb/sq in (13 to 14.4 J/sq mm), when tested in accordance with ASTM D 256.
 - 9. Hardness: M 72, when tested in accordance with ASTM D 785, Rockwell.
 - 10. Variation from Dimensions Indicated on Drawings: Plus and minus 1/8 inch (3 mm), maximum.
 - 11. Variation from Plane Along Edge or Surface: Plus and minus 1/16 inch per linear foot (1.5 mm in 300 mm), maximum.
 - 12. Outside Corner Radius: 1/16 inch to 1/8 inch (1.5 to 3 mm).
 - 13. Draft Angle: 3 degrees, minimum, on returns, setbacks, reveals, and grooves.
 - 14. Items Too Large or Heavy to be Adhesively Installed: Provide concealed anchorage points for plaster type wire anchors.
- B. Joint Cement: Liquid Nails, or equivalent.
- C. Joint Tape and Compound: Types recommended for gypsum wallboard work.
- D. Joint Sealant: refer to Section 079200.
- E. Suspension system: metal framing, cables and hardware, galvanized steel; size and type to suit application and supporting materials.

PART 3 - EXECUTION**A. EXAMINATION**

CHASE

SECTION 092350 – GLASS FIBER REINFORCED GYPSUM (GFRG) FABRICATIONS

1. Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.
2. If substrate preparation is the responsibility of another installer, notify GC of unsatisfactory preparation before proceeding.
3. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect and wait for instructions before beginning installation.

B. PREPARATION

1. Clean substrate surfaces thoroughly prior to installation.
2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
3. Install supplementary, temporary, and permanent supports as required for proper installation.

3.2 INSTALLATION

- A. Install in accordance with applicable code and manufacturer's recommendations, plumb and true to line; shim where necessary.
- B. Coordinate work with related gypsum wallboard work.
- C. Join pieces with cemented butt joints except at control and expansion joints.
- D. Finish exposed joints the same as specified for adjacent gypsum board work in Section 092900.
- E. Finish joints and surfaces as required for Level 5 in ASTM C 840.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

CHASE
SECTION 092423 – PORTLAND CEMENT STUCCO

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Materials and installation of exterior stucco wall covering backed with air/moisture barrier, water-resistive barrier, and drainage mat.

1.2 RELATED SECTIONS

- A. 033000 – Cast-In-Place Concrete.
- B. 042000 – Unit Masonry.
- C. 061000 – Rough Carpentry.
- D. 061643 – Exterior Gypsum Sheathing.
- E. 072113 – Board Insulation.
- F. 072500 – Weather Barriers.
- G. 075400 – Thermoplastic Membrane Roofing.
- H. 076200 – Sheet Metal Flashing and Trim.
- I. 076526 – Self-adhering Sheet Flashing.
- J. 079200 – Joint Sealants.
- K. 081113 – Hollow Metal Doors and Frames.
- L. 084113 – Aluminum-Framed Entrances and Storefronts.
- M. 084400 – Curtain Wall and Glazed Assemblies.
- N. 092200 – Light Gauge Metal Support Framing.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) Standards, latest edition unless noted otherwise.
 - 1. A 641 – *Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.*
 - 2. A 653 – *Specification for Sheet Steel Zinc coated (Galvanized) by the Hot-Dip Process, Commercial Quality.*
 - 3. B 69 – *Specification for Rolled Zinc.*
 - 4. C 144 – *Specification for Aggregate for Masonry Mortar.*
 - 5. C 297 – *Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.*
 - 6. C 578 – *Specification for Preformed, Cellular Polystyrene Thermal Insulation.*
 - 7. C 847 – *Standard Specification for Metal Lath.*
 - 8. C 897 – *Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.*
 - 9. C 926 – *Standard Specification for Application of Portland Cement-Based Plaster.*
 - 10. C 1063 – *Standard Specification for Installation of Lathing and Furring for Portland Cement Plaster.*
 - 11. C 1177 – *Specification for Glass Mat Gypsum for Use as Sheathing.*
 - 12. C 1513 – *Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.*
 - 13. D 226 – *Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.*
 - 14. D 1784 – *Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.*
 - 15. D 4541 – *Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.*
 - 16. E 84 – *Test Method for Surface Burning Characteristics of Building Materials.*
 - 17. E 96 – *Standard Test Methods for Water Vapor Transmission of Materials.*
 - 18. E 283 – *Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.*
 - 19. E 330 – *Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.*

CHASE
SECTION 092423 – PORTLAND CEMENT STUCCO

- 20. E 331 – *Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.*
- 21. E 783 – *Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.*
- 22. E 2178 – *Standard Test Method for Air Permeance of Building Materials.*
- 23. E 2357 – *Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.*
- 24. E 2430 – *Standard Specification for Expanded Polystyrene ("EPS") Thermal Insulation Boards For Use in Exterior Insulation and Finish Systems ("EIFS").*
- 25. G 154 – *Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.*
- B. American Iron and Steel Institute (AISI).
 - 1. AISI S200 – 2007 North American Standard for Cold-Formed Steel Framing-General Provisions
- C. APA Engineered Wood Association, latest edition unless noted otherwise.
 - 1. PS 1 – *Voluntary Product Standard, Structural Plywood.*
 - 2. PS 2 – *Performance Standard for Wood-Based Structural-Use Panels.*
 - 3. E 30 – *APA Engineered Wood Construction Guide.*
- D. International Code Council (ICC), latest edition unless noted otherwise.
 - 1. *2012 and 2015 International Building Code (IBC).*
 - 2. ES, ESR – *International Code Council Evaluation Service Report.*
 - 3. AC 11 – *Acceptance Criteria for Cementitious Exterior Wall Coatings.*
 - 4. AC 212 – *Acceptance Criteria for Water-resistive Coatings used as Water-resistive Barriers over Exterior Sheathing.*
- E. National Fire Protection Association (NFPA) Standards, latest edition unless noted otherwise.
 - 1. NFPA 285 – *Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus.*
- F. United States Environmental Protection Agency (EPA) Standards.
 - 1. Code of Federal Regulations (CFR) Title 40 Part 59 – *National Volatile Organic Compound Emission Standards for Consumer and Commercial Products.*

1.4 DESIGN REQUIREMENTS

- A. Structural.
 - 1. Stucco support systems shall provide for maximum allowable deflection of L/360, normal to the plane of the wall.
 - 2. Stucco support systems shall be designed for wind load in conformance with building code requirements.
 - 3. Refer to applicable ICC ESR for wind load limitations that may apply.
- B. Moisture control.
 - 1. Prevent the accumulation of water into or behind the stucco, either by condensation or leakage into the wall construction, in the design and detailing of the wall assembly.
 - 2. Adjust wall assembly components accordingly to minimize the risk of condensation.
 - 3. Exclude the use of vapor retarders on the interior side of the wall in warm, humid climates.
 - 4. Provide a weather barrier over sheathing, concrete and masonry per the requirements of Section 072500 – Weather Barriers, positioned as indicated in the drawings.
 - 5. At through-wall expansion joints and at joints formed with back-to-back casing beads, back joints with a moisture-resistant membrane.
 - 6. Seal stucco terminations, accessory butt joints and penetrations with appropriate sealant, or backer rod and sealant, as dictated by joint type.
- C. Grade condition.
 - 1. Do not install stucco below grade or on surfaces subject to continuous or intermittent water immersion or hydrostatic pressure. Provide minimum 4 inch (100 mm) clearance above earth grade, and minimum 2 inch (51 mm) clearance above paved surfaces. Provide increased clearance in freeze/thaw climate zones.
- D. Projecting architectural features.

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1. Stucco shall not be installed on weather-exposed surfaces of less than 1:2 slope.
 2. Projections shall be constructed of rigid expanded polystyrene (EPS) boards as indicated in Section 072400 – Exterior Insulation and Finish System.
 3. All projecting architectural features shall have a minimum 1:2 slope along their top surface. All foam horizontal reveals must have a minimum 1:2 slope along their bottom surface to prevent accumulation of ice/snow
 4. Where projection exceeds 2 inches (51 mm) from the face of the wall plane, apply waterproof membrane compliant with Section 076526 - Self-Adhering Sheet Flashing to the top surface of the substrate.
 5. Limit foam thickness to a maximum of 4 inches (102 mm).
 6. Support all EPS boards with framing or other structural support
- E. Joints and accessories.
1. Refer to drawings for general positioning of joints and accessories.
 2. Provide two-piece expansion joints in the stucco assembly where building movement is anticipated:
 - a. At joints in the substrate or supporting construction.
 - b. Where the system is to be installed over dissimilar construction or substrates.
 - c. At changes in building height.
 - d. At floor lines, columns and cantilevered areas.
 3. Provide one-piece expansion joints every 144 ft² (13 m²) of stucco surface area. Position expansion joints so as not to exceed length-to-width ratio of 2.5, with a maximum joint spacing of 18' in any single direction.
 - a. Cut and wire-tie lath to the expansion joint accessory so lath is discontinuous at or beneath the accessory.
 - b. Where casing bead is used back-to-back as the expansion joint, back the joint with a moisture-resistant membrane.
 4. Provide minimum 3/8 inch (9 mm) wide one-piece expansion joints where the system abuts windows, doors and other through-wall penetrations.
 5. Provide appropriate accessories and sealants at stucco system terminations and joints. Refer to Section 079200 – Joint Sealants.
 6. Provide horizontal channel reveal trim as specified and detailed in the construction drawings.
- F. Fire Protection
1. Refer to Construction Types in drawings for fire-resistance-rated construction requirements.
- G. Solid substrates (concrete and CMU).
1. Provide surface plane tolerance not to exceed 1/4 inch in 10 feet (6 mm in 3.0 m).
 2. Concrete masonry shall be open-texture units with flush joints.
 3. Do not install air/moisture barrier materials over efflorescence, weak surface conditions, painted, coated, non-absorbent, salt-contaminated, or any concrete or CMU substrate where adhesion is in question. Proof-test adhesion to prepared poured-in-place or precast concrete surfaces and impose a regimen of quality control tests to verify adhesion throughout the project.
- H. Stucco thickness not including primer or textured finish coat.
1. Stucco thickness shall be uniform throughout the wall area, 3/4" - 7/8" (18-22 mm).
 2. Stucco shall be applied in 2 coats, scratch and brown coat, to achieve the prescribed thickness.

1.5 PERFORMANCE REQUIREMENTS

- A. Air/Moisture Barrier
1. The substrate shall include a vapor-permeable Air Barrier Sheet compliant with Section 072500 – Weather Barriers, as indicated in the drawings.
- B. Drainage Mat
1. As provided or recommended by the stucco system manufacturer.
 2. Surface burning characteristics per ASTM E 84: flame spread less than 25, smoke developed less than 450, Class A building material.
- C. Stucco base
1. Stucco scratch and brown coat material in compliance with ASTM C 926 and manufactured or recommended listed by the finish coat manufacturer.

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2. Single-coat stucco material in compliance with ICC AC 11, listed by ICC ES, and manufactured or recommended listed by the finish coat manufacturer.
- D. Primer: alkaline-resistant primer for freshly placed (minimum 4 day old) stucco surfaces.
 1. Resistant to alkaline surfaces with pH of 13 or less.
 2. Surface burning characteristics per ASTM E 84: flame spread < 25, smoke developed < 450, Class A building material.
 3. VOC: less than 50 g/L.
- E. Acrylic finish
 1. Accelerated weathering per ASTM G 154: 2000 hours, no blistering, checking, cracking, crazing, or other deleterious effects.
 2. Water vapor permeability per ASTM E 96, Method B: > 30 perms [1722 ng/(Pa · s · m²)].
 3. Surface burning per ASTM E 84: flame spread < 25, smoke developed < 450, Class A building material.
 4. VOC: less than 50 g/L.

1.6 SUBMITTALS

- A. Product data.
 1. For each product, manufacturer's specifications, details, installation instructions and product data.
- B. Code-compliance documents.
 1. Weather barrier manufacturer's code compliance report.
 2. Stucco manufacturer's code compliance report where ICC-listed one-coat stucco is used.
 3. EPS board manufacturer's certificate of compliance with ASTM E 2430-05.
 4. Where fire-resistance-rated construction types are applicable, submit weather barrier / drainage mat manufacturer's NFPA 285 assembly report or ICC ESR indicating compliance NFPA 285 for use on applicable rated construction types.
 5. Fastener manufacturer's pull-out or withdrawal capacity testing for frame and solid substrates.
- C. Warranty.
 1. For each product, manufacturer's standard warranty documents.
- D. Samples.
 1. Submit to Architect of Record two samples of each finish coat color and texture combination, minimum 12" x 12" on non-deforming substrate. Samples shall represent the typical full range of color and texture for each type.

1.7 QUALITY ASSURANCE

- A. Manufacturer qualifications.
 1. A single manufacturer shall provide and install the work of this Section, and shall have a minimum of twenty years experience manufacturing products in this section shall provide all products listed.
- B. Installer qualifications.
 1. Licensed, insured and engaged in application of Portland cement stucco for a minimum of three years.
 2. Employ skilled technicians who are experienced and knowledgeable in Portland cement stucco application, and familiar with the requirements of the specified work.
 3. Successful completion of minimum of three projects of similar scope and complexity to the specified project.
 4. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with the manufacturer's published specifications and details and the project plans and specifications.
- C. Insulation board manufacturer requirements
 1. All materials used shall be listed by an approved agency. Insulation board shall be manufactured and labeled in conformance with the stucco manufacturer, the approved listing agency, and the applicable building code.
- D. Inspections
 1. Provide independent third party inspection where required by code, contract documents or manufacturer's warranty.

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2. Conduct inspections in accordance with code requirements and contract documents.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.
- B. Protect EPS insulation materials: cover as required to avoid prolonged UV exposure, and keep away from sources of heat, sparks, flame, flammable or volatile materials. Store on a clean, flat surface, off the ground, in a dry area.
- C. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32° C). Do not store products exposed to direct sunlight.
- D. Protect portland cement based materials (bag products) from moisture and humidity. Store under cover, off the ground, in a dry location.
- E. Handle all products as directed on labeling.

1.9 PROJECT CONDITIONS

- A. Apply stucco materials only during periods with ambient air temperatures above 40°F (4°C) during application and for 24 hours after set of stucco, and after application of weather barrier and finish materials.
- B. For application of stucco materials during periods with ambient air temperatures less than 40°F (4°C), provide supplementary heat for installation such that the required material temperatures are maintained. Prevent concentration of heat, vent fumes and other products of combustion on uncured stucco.
- C. Prevent uneven or excessive evaporation of moisture from stucco during hot, dry or windy weather. For installation under any of these conditions provide special measures to properly moist-cure the stucco. Do not install stucco if ambient temperatures are expected to rise above 100 deg. F (38oC) within a 24-hour period.
- D. Protect adjacent finish work by other trades from damage during stucco installation.

1.10 SCHEDULING / SEQUENCING

- A. Coordinate fabrication, delivery, and installation with the general contractor and other applicable trades.
- B. Protect sheathing from climatic conditions to prevent weather damage until the installation of the weather barrier.
- C. Wherever water can enter the wall assembly, install diverter flashings to direct water to the exterior.
- D. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous weather barrier. Rough openings shall include weather barrier wraps at all edges, and head and sill flashing prior to stucco work commencing. Notify the General Contractor immediately if any of this work is incomplete or incorrect, and do not proceed with stucco installation until corrected.
- E. Weather barrier must be covered by exterior cladding system within 180 days.
- F. Drainage mat must be covered by stucco cladding within 30 days of installation.
- G. Commence the stucco installation only after completion of all floor, roof and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the stucco.
- H. Install copings and sealant immediately after installation of the stucco and when finish coatings are dry.
- I. Provide structural support to building structure for all elements penetrating the stucco system in order to eliminate any load bearing on the stucco. Provide air-tight and water-tight sealants and backer rods conforming to the requirements of Section 079200 – Joint Sealants.

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1.11 WARRANTY

- A. A. Provide manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT STUCCO

- A. Manufacturers.
1. Sto Corporation; www.stocorp.com.
 2. Parex USA, Inc.; www.parex.com.
 3. Dryvit Systems, Inc.; www.dryvit.com.
 4. Stuc-O-Flex International, Inc.; www.stucoflex.com
 5. Substitutions: refer to Section 016000.
- B. Scratch and brown coats: Portland cement stucco concentrate in compliance with ASTM C 926.
- C. Primer: Acrylic-based primer/sealer for freshly placed (minimum 4 day old) and high-pH stucco surfaces.
- D. Finish coat: Integrally-colored, factory-blended, acrylic textured wall finish with graded marble aggregate.

2.2 FOAM TRIM AND BUILD-OUTS

- A. Foam insulation board for trim: Nominal 1.0 lb/ft³ (16 kg/m³) expanded polystyrene (EPS) boards in compliance with ASTM C 578 Type I requirements, and ASTM E 2430.
- B. Adhesive and base coat: as manufactured or recommended by the stucco manufacturer.
- C. Reinforcing Mesh
1. General: Nominal 4.5 oz./yd² (153 g/m²), symmetrical, interlaced open-weave glass fiber mesh treated with alkaline resistant coating for compatibility with portland cement materials to achieves Standard Impact Classification over foam insulation board.
 2. Detail areas: Nominal 4.2 oz./yd² (143 g/m²), flexible, symmetrical, interlaced open-weave glass fiber fabric treated with alkaline resistant coating for compatibility with portland cement materials for use as foam back-0wrapping and aesthetic detailing.

2.3 WEATHER BARRIER

- A. As specified in Section 072500 – Weather Barriers.
- B. As manufactured or recommended by the portland cement stucco system manufacturer.
1. Minimum No. 15 asphalt saturated felt complying with ASTM D 226, Type 1, or one layer of Grade D kraft building paper, or paper-backed stucco lath.

2.4 DRAINAGE MEMEMBRANE

- A. As manufactured or recommended by the portland cement stucco system manufacturer.

2.5 LATH

- A. Minimum 2.5 lb./yd² (1.4 kg/m²) self-furred galvanized steel diamond mesh metal lath in compliance with ASTM C 847.

2.6 MECHANICAL FASTENERS

- A. Non-corroding fasteners in compliance with AISI S200 – 2007 and ASTM C 1513.
1. Wood framing.
 - a. Minimum 11-gauge, 7/16 inch (11 mm) diameter head galvanized roofing nails with minimum 3/4 inch (19mm) penetration into studs.
 - b. Minimum #8 Type S wafer head fully threaded corrosion resistant screws with minimum 3/4 inch (19 mm) penetration into studs.
 2. Steel framing: Minimum #8 Type S or S-12 wafer head fully threaded corrosion-resistant screws with minimum 3/8 inch (10 mm) and three-thread penetration into studs.
 3. Concrete or unit masonry: Minimum # 8 wafer head fully threaded corrosion-resistant screws for masonry with minimum 1 inch (25 mm) penetration into substrate.

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2.7 ACCESSORIES

- A. Weep screed, casing bead, corner bead, corner lath, expansion/control joint and similar edge and joint accessories.
 - 1. All accessories shall meet the requirements of ASTM C 1063 and its referenced documents.
 - 2. Where permitted by building code, PVC plastic in compliance with ASTM D 1784, cell classification 13244C.
 - 3. Zinc in compliance with ASTM B 69.
 - 4. Galvanized steel in compliance with ASTM A 653 with G60 coating.
- B. Horizontal Channel reveal trim as specified and detailed in the construction drawings.
- C. All accessories shall have perforated or expanded flanges and shall be designed with grounds for the specified thickness of stucco.

2.8 SITE-MIXED INGREDIENTS

- A. Water: clean and potable.
- B. Sand: in compliance with ASTM C 897 or ASTM C 144, for use with one coat and ASTM C 926 stucco concentrates

PART 3 - EXECUTION

3.1 MIXING

- A. Mix all materials with a clean, rust-free electric drill and paddle to a uniform consistency. Do not thin materials or dilute with water unless directed by the manufacturer.
- B. Mix only as much material as can readily be used.
- C. Do not add lime, anti-freeze compounds, or other additives to any of the materials unless directed by the manufacturer. Where additives are permitted or recommended, use only those specified by the manufacturer.

3.2 EXAMINATION

- A. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air/moisture barrier or stucco installation to the General Contractor. Do not proceed with weather barrier, insulation board, drainage mat or stucco installation until deviations are corrected.
- B. Inspect substrate surfaces to receive finishes for the following and correct before proceeding with work.
 - 1. Contamination: Algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
 - 2. Surface absorption and chalkiness.
 - 3. Cracks: Measure crack width and record location of cracks.
 - 4. Damage and deterioration.
 - 5. Moisture damage: Record any areas of moisture damage.
- C. Inspect sheathing application for compliance with applicable standards.
 - 1. Glass mat-faced gypsum sheathing: ASTM C 1177 - refer to manufacturer's instructions and/or ICC evaluation report.
 - 2. Exterior grade and exposure 1 wood-based sheathing: APA Engineered Wood Association E 30.
 - 3. Wood-based sheathing must be gapped 1/8 inch (3mm) at edge and end joints to prevent cracking in the stucco.

3.3 SURFACE PREPARATION

- A. Concrete and concrete masonry (CMU).
 - 1. Remove surface contamination such as oil, grease, dust, dirt, algae, mildew, salts, paint or coatings. Correct weak surface conditions such as laitance. Use chemical cleaners such as TSP (trisodium phosphate) detergent to remove oil and grease and rinse with potable water. Use chemical cleaners to remove efflorescence or other surface contamination in accordance with manufacturer's written instructions. Use mechanical methods such as waterblasting, sandblasting, and wire brushing to remove weak surface conditions.

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2. Repair cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply joint treatment material over crack, embed reinforcement (where applicable), and smooth joint treatment material with a trowel, drywall or putty knife to cover the reinforcement.
3. Remove projecting fins, ridges, and mortar by mechanical means.
4. Fill honeycombs, aggregate pockets, holes and other voids with the stucco manufacturer's patching material.
5. Where the surface is excessively "rough" or out of plane, skim coat the wall surface with the stucco manufacturer's base coat material to provide a smooth, level surface.

B. Sheathing.

1. Remove surface contaminants and replace damaged sheathing.
2. All sheathing must be handled and installed in compliance with applicable building code and/or manufacturer requirements. Sheathing must be clean, dry and free from damage, frost, and all bond-inhibiting materials. Abut gypsum sheathing joints. Gap wood sheathing 1/8 inch (3 mm) at joints. Should gaps exceed 1/8 inch (3 mm) up to 1/2 inch (13 mm) wide, use stucco manufacturer's joint filler to fill joints.
3. Spot-repair surface defects in sheathing with manufacturer's recommended joint treatment.

3.4 WEATHER BARRIER

- A. Refer to Section 072500 – Weather Barriers.

3.5 DRAINAGE MAT

- A. Place drainage mat against the wall surface over the insulation and unroll horizontally with the fabric facing out. Hammer-tack or staple into sheathing with corrosion-resistant fasteners. Use as few fasteners as needed to hold the mat in place, starting from the bottom of the wall at base flashing or weep screed and working up.
- B. Do not fasten through flashing.
- C. Shingle lap-fabric at horizontal courses. Shingle lap drainage mat over flashing at floor lines, decks, roof lines, window heads, and other areas where flashing is required, to direct water to the exterior.
- D. Butt ends of rolls and vertical seams.
- E. Trim around windows, doors, vents, or other penetrations through the wall. Do not install behind window nail flanges.
- F. Immediately follow installation of drainage mat with stucco lath installation. Where stucco lath installation will not immediately follow installation of drainage mat, use corrosion-resistant cap nails, cap staples, or cap screws every 16 inches (406 mm) on center along framing for more secure attachment.
- G. Cover drainage mat with stucco within 30 days of installation.

3.6 STUCCO SYSTEM

A. General.

1. Apply the stucco in discrete panels without interruption to avoid cold joints and differences in appearance.
2. Abut wet stucco to set stucco at natural or architectural breaks in the wall such as expansion joints, pilasters, terminations, or changes in plane.
3. Do not install stucco during extremely hot, dry and/or windy conditions.
4. Do not install stucco during freezing conditions or on frozen substrates.
5. Do not install stucco onto grounds of accessories. Completely embed lath and flanges of accessories and completely cover fastener attachments with stucco.
6. Moist-cure stucco minimum 48 hours for optimum strength gain and resistance to cracking. Allow final stucco application to completely dry (28 days) before applying primer or finish.
7. The finished installation must be true, plumb and square.
8. Should stucco get into control or expansion joints, remove the stucco from within the joint before the stucco sets.

B. Weep screeds.

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1. Install weep screeds in conjunction with flashing and weather barrier to facilitate shingle-lapping of components at base of wall, soffits and openings as indicated in the drawings.
 2. Install weep screed over solid substrate or framing with the appropriate fastener. Locate foundation weep screed so that it overlaps the joint between the foundation and framing by a minimum of 1 inch (25mm).
 3. Lap waterproof air barrier, sheet water-resistive barrier, and drainage mat over the weep screed attachment flange.
- C. Casing beads, reveals, and expansion joints.
1. Refer to drawings for aesthetic joint locations, and coordinate expansion joint placement to minimize the requirement for additional or conflicting visible façade lines.
 2. Install casing beads at stucco terminations: doors, windows and other through-wall penetrations.
 3. Install two-piece expansion joints (or back-to-back casing beads) at building expansion joints, through-wall joints in concrete or CMU, where the stucco is to be installed over dissimilar construction or substrates, at changes in building height, at floor lines, columns, and cantilevered areas. Install full accessory pieces where possible and avoid small pieces.
 4. Seal adjoining pieces by embedding ends in sealant.
 5. Abut horizontal into vertical joint accessories (except where horizontal movement joints exist that prevent continuous vertical runs of accessories).
 6. Attach at no more than 7 inches (178 mm) from edge of substrate/framing with appropriate fasteners.
 7. Air barrier and moisture protection must be continuous behind joints and accessories.
- D. Lath.
1. Install metal lath in conformance with ASTM C 1063.
 2. Install metal lath with the long dimension at right angles to structural framing (horizontally on solid substrates).
 3. Terminate lath at expansion joints. Do not install continuously at joints.
 4. Overlap side seams minimum 1/2 inch (13 mm) and end seams minimum 1 inch (25 mm). Stagger end seams.
 5. Do not install lath continuously beneath expansion joints. Overlap casing beads and expansion joints minimum 1 inch (25 mm) over narrow wing accessories, minimum 2 inches (51 mm) over expanded flange accessories.
 6. Fasten securely into solid substrates or through sheathing into structural framing at 7 inches (178 mm) on center maximum vertically and 16 inches (406 mm) on center horizontally. Wire-tie at no more than 9 inches (225mm) on center at side laps, accessory overlaps, and where end laps occur between supports.
 7. Paper-backed lath: Follow installation as for diamond mesh metal lath. Lap lath over lath, not paper over lath. For horizontal overlaps the paper backing must shingle-lap behind the lath-to-lath overlap.
- E. One-piece expansion joints.
1. Install one-piece expansion joints at through-wall penetrations such as doors and windows, and throughout the façade spaced as required to form panels no greater than 144 ft² (13 m²).
 2. Wire-tie one-piece expansion joints to lath at no more than 7 inches (178 mm) on center. Seal adjoining pieces by embedding ends in sealant. Lath must be discontinuous at or beneath joints.
- F. Inside and outside corners
1. Install corner lath at inside corners and corner bead at outside corners over lath.
 2. Fasten through lath into solid substrate or framing at no more than 7 inches (178 mm) on center with appropriate fasteners.
- G. Stucco.
- a. Scratch Coat: Apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, 3/8 or . inch (9 or 12 mm), to cover the metal lath and to permit scoring the surface. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
 - b. Brown Coat: As soon as the first coat is firm enough to receive the second coat without damage, apply the second coat. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to

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- a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be uniform throughout the wall area and shall be 7/8 inch (19 or 22 mm).
- c. After the stucco has become slightly firm float the surface lightly to densify and smooth the surface.
 - 2. Moist cure after the stucco has set by lightly fogging for at least 48 hours. Fog as frequently as required during the 48 hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist curing can be diminished.
- H. Primer.
- 1. Apply primer evenly with brush, roller or proper spray equipment over the clean, dry stucco and foam build-outs, and allow to dry.
 - 2. Final age of primed stucco application must be minimum 7 days before application of finish.
- I. Finish.
- 1. Apply finish only to primed stucco and foam build-outs.
 - 2. Apply finish by spraying or troweling with a stainless steel trowel, depending on the finish specified.
 - 3. Avoid application in direct sunlight.
 - 4. Apply finish in a continuous application, and work a wet edge towards the unfinished wall area. Work to an architectural break in the wall before stopping to avoid cold joints.
 - 5. Adjust work schedule to conform to temperature and humidity requirements of the stucco finish manufacturer to ensure the highest-possible finish quality.
 - 6. Do not install separate batches of finish side-by-side.
 - 7. Do not apply finish into or over sealant joints.
 - 8. Apply finish to outside face of wall only.
 - 9. Extend finish onto all surfaces of reveal trims, unless noted otherwise in the construction drawings.
 - 10. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.
 - 11. Do not install finish over high pH (> 10) stucco surfaces or surfaces that have not been fully cured.

3.7 PROTECTION

- A. Protect installed materials from water infiltration into or behind them.
- B. Protect completed and in-progress work from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.
- C. Provide sealant and backer material at stucco terminations and at fixture penetrations through the stucco to protect against air, water and insect infiltration.
- D. Provide weeps at floor lines, window and door heads, and other areas to conduct water to the exterior.

3.8 CLEANING, REPAIR AND MAINTENANCE

- A. Prior to final occupancy by the Owner, clean and maintain the stucco finish for a fresh appearance and to prevent water entry into and behind the stucco.
- B. Repair cracks, impact damage, spalls or delamination promptly.
- C. Maintain adjacent components of construction such as sealants, windows, doors, and flashing, to prevent water entry into the wall assembly.

END OF SECTION

CHASE
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Gypsum soffit board.
- B. Related Sections:
 - 1. 061000 – Rough Carpentry: Wood framing.
 - 2. 072117 – Fibrous Insulation.
 - 3. 092200 – Lightgauge Metal Support Framing: Support framing for gypsum board; tolerance requirements.
 - 4. 093100 – Thin-Set Tiling
 - 5. 098100 – Acoustic Insulation.
- C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to work of this Section.
- D. Substitutions: Substitutions will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
 - 2. C557 - Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - 3. C931 - Standard Specification for Exterior Gypsum Soffit Board.
 - 4. C1002 - Steel Drill Screws for the Application of Gypsum Board.
 - 5. C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - 6. C1278 - Specification for Fiber Reinforced Gypsum Panels.
 - 7. C1395 - Specification for Gypsum Ceiling Board
 - 8. C1396 - Specification for Gypsum Board
 - 9. D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- B. Gypsum Association (GA):
 - 1. GA-214 - Recommended Levels of Gypsum Board Finish.
 - 2. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
- C. Northwest Wall and Ceiling Bureau (NWCB): LFGB-398 - Recommended Levels for Finishing of Gypsum Board.
- D. Underwriters Laboratories (UL) 752 - Standard for Bullet Resisting Equipment.

1.3 SUBMITTALS

- A. Make submittals in accordance with Section 013300.
- B. Submit complete manufacturer's product literature and installation instructions for each of the materials used.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with GA 216, unless specified otherwise, or required otherwise to meet fire rating requirements.
- B. Regulatory Requirements:
 - 1. Provide assemblies meeting the hourly fire ratings indicated and specified. Assemblies shall be approved by the local jurisdictional authorities.
 - 2. Fire rating requirements take precedence over the construction requirements indicated. In the event of conflict, notify the Architect, and do not begin construction in the area of conflict until the conflict has been resolved.

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SECTION 092900 - GYPSUM BOARD

PART 2 - PRODUCTS

2.1 GYPSUM BOARD MATERIALS

- A. Furnish boards of maximum permissible length for type of installation indicated, tapered edge for boards to be exposed, taped and finished; square edge for boards in concealed applications; 5/8 inch thick unless noted or specified otherwise; furnish type X for fire rated partitions.
- B. Types:
 - 1. Standard gypsum board
 - a. Installed at all interior surfaces not designated for water resistant gypsum board.
 - b. Manufactured in accordance with ASTM C1396; 5/8 inch thickness unless otherwise indicated.
 - 2. Water resistant gypsum board
 - a. Installed at all wall and ceiling surfaces to receive gypsum board in:
 - 1) Restrooms.
 - 2) Plumbing Rooms and Janitors Closets.
 - 3) Lounge walls in contact with Kitchenette counter.
 - 4) Walls to which drinking fountains are attached and adjacent within 1'-0".
 - b. Manufactured in accordance with ASTM C1396; 5/8 inch thickness unless otherwise indicated.
 - c. Shall be easily identifiable by a paper facing color different from other gypsum board products installed at the project.
 - 3. 3/4 inch Fire Rated Board: Type IP-X3; USG "Sheetrock"; "Ultracode" core.
 - 4. Ceiling Board: ASTM C1395; sag resistant.
 - 5. Abuse Resistant Board: ASTM C1278; USG Corporation "Fiberock VHI Gypsum Fiber Panels"; 5/8 inch thickness.
 - 6. Abuse Resistant Board: ASTM C1278; USG Corporation "Fiberock Aqua-Tough Interior Panels"; 5/8 inch thickness; Type X; surfaces shall be resistant to mold and mildew growth; score of 10 when tested in accordance with ASTM D3273.
 - 7. Typical fire rated partitions and ceilings: 5/8" USG Corporation SHEETROCK® brand SW, FIRECODE® or FIRECODE® "C" Core gypsum panels

2.2 ACCESSORIES

- A. Security Panel: Ballistic panel composed of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and molded into flat rigid sheets. The production technique and materials used shall provide the controlled internal delamination to permit the encapture of a penetrating projectile, as necessary for Level 2 protection in accordance with UL 752; one of the following.
 - 1. Safeguard Security Services Inc. (512-661-8306) "Armortex O.F.200."
 - 2. C.R. Laurence Co, Inc. (Los Angeles CA; 800-421-6144) "BRF200 Bullet Resistant Fiberglass Panels."
 - 3. Waco Composites Inc. (Waco TX; 254-776-8880; www.armorcore.com) "Armorcore."
- B. Adhesive for laminated construction: ASTM C557, unless recommended otherwise by the gypsum board manufacturer.
- C. Interior Gypsum Trim:
 - 1. Conform to GA 216, unless indicated or specified otherwise.
 - 2. Concealed flange crimp-on or tape-on type; metal or PVC at Contractor's option.
 - 3. Control Joint Trim: USG 093 or approved.
 - 4. Reveal Moldings: Fry Reglet Co., Pittcon Industries, Inc., Gordon Inc, or approved; aluminum extrusions with tapping flanges; shapes as indicated.
- D. Joint Tapes:
 - 1. Standard: ASTM C475 and GA 216.
 - 2. Mesh Tape for Water Resistant Backing Board: 2-1/2 inch wide glass fiber tape; 10x10 mesh; self adhesive type.
- E. Joint Compound, Tape, and Finishing Compound: ASTM C475; furnish setting type joint compound for use at water resistant board.
 - 1. Typical: USG "SHEETROCK Brand Taping, All-Purpose, and/or Topping Compound," or approved.

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SECTION 092900 - GYPSUM BOARD

- 2. Setting Type: USG "SHEETROCK Brand Easy Sand Setting-Type Joint Compound," or approved.
- F. Screws: ASTM C1002.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- B. Do not begin work until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 216, and fire rated assembly requirements.
- B. Erect wallboard so that edges and corners are firmly supported.
- C. Use screws to fasten gypsum board to metal furring or framing. Adhesive application of gypsum board may be used if it is in accordance with the manufacturer's recommendations and meets fire rating requirements.
- D. Double Layer Applications:
 - 1. Use backing board or standard board for first layer.
 - 2. Offset joints of second layer from joints of first layer.
- E. Security Panel: Trim to extend to floor and intersections with adjacent partitions and other construction as detailed; install into partition prior to covering with gypsum board.
 - 1. Incorporate into partition to minimum height of 8'-0" AFF at partitions indicated for protection. Shim as necessary above panels to maintain plane of finish. Secure to framing with adhesive, mastic, or screws unless noted otherwise.
 - 2. Extend panels into metal door and window frames, and as necessary to maintain bullet-resistant rating at all penetrations.
 - 3. Install shims as necessary to maintain finish plane at portions of the wall where ballistic security is not required.
- F. Trim:
 - 1. Use longest practical lengths, with no piece less than 2 feet long for continuous runs greater than 8 feet. Securely fasten and align trim ends at joints.
 - 2. Place concealed flange corner beads at external corners. At angles other than 90 degrees, bend the flange to conform to the angle.
 - 3. Place concealed flange type L trim where gypsum board abuts dissimilar materials.
 - 4. Use J trim at exposed gypsum board edges and at joints where sealant is indicated.
- G. Allow a 1/2 inch gap where gypsum board extends to overhead structure and deflection provisions are incorporated into lightgage metal framing. Do not fasten gypsum board to top runner.
- H. Sealant Joints:
 - 1. Coordinate installation of firestopping and sealants at concealed joints between partitions and structure at fire rated and acoustically insulated partitions.
 - 2. Where sealant joints are indicated at ends or edges of wallboard, install for uniform 1/8 inch joint, unless otherwise indicated. Installation of sealant in exposed locations is specified in Section 079200.
- I. Provide water resistant gypsum board at walls in restrooms, toilets, janitor closets and other areas subject to similar damp conditions.
- J. Install required number of layers of wallboard behind panel boards, fire extinguisher cabinets, and other recessed elements as necessary to maintain fire rating of walls.

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SECTION 092900 - GYPSUM BOARD

3.3 CONTROL JOINTS

- A. Discontinue gypsum board and use control joint trim at control joints.
- B. Coordinate with the framing installer to ensure that framing is installed immediately on either side of each control joint.
- C. Space control joints as indicated. When not indicated, locate as follows:
 - 1. At maximum 30 foot intervals along continuous wall planes.
 - 2. At maximum 50 foot intervals at continuous ceilings with perimeter relief.
 - 3. At maximum 30 foot intervals at continuous ceilings without perimeter relief.
 - 4. At locations where expansion or control joints occur in the building structure.
 - 5. Locate control joints to form rectangular or square sections, in "L," "U," "T," or other irregularly shaped areas.
 - 6. Position control joints to intersect light fixtures, air diffusers, door openings, and other areas of stress concentration.
 - 7. Coordinate with Section 092200 for special requirements at fire rated assemblies.
- D. Verify location with the Architect prior to installation. Give the Architect a minimum of 48 hours notice.

3.4 FINISHING

- A. Provide finishing in accordance with GA 214.
- B. Where necessary to sand, do so without damaging the face of the gypsum board.
- C. Levels of Finish:
 - 1. Level 5: Provide at the following locations:
 - a. Surfaces perpendicular and adjacent to or near (within 24 inches of) exterior windows, and surface mounted light fixtures.
 - b. Surfaces to receive deep tone colors and/or semi-gloss or gloss finishes.
 - 2. Level 4: Typical, unless indicated or specified otherwise.
 - 3. Level 3: Provide at the following locations:
 - a. Surfaces to receive vinyl wall covering.
 - 4. Level 2: Provide at the following locations:
 - a. Storage rooms.
 - b. Mechanical rooms.
 - c. Janitors closets.
 - d. Surfaces to receive tile or other thick finish materials applied to gypsum board surfaces.
 - 5. Level 1: Provide at the following locations:
 - a. Surfaces of fire rated assemblies concealed from view in the finished work ("fire-taping").
 - b. Surfaces of acoustical assemblies concealed from view in the finished work
- D. Level 4 and 5 finishes: Return to the site after primer is applied, and touch-up surface defects.
- E. Proprietary skim coat material may be used in lieu of joint compound as skim coat at surfaces indicated for Level 5 finish.
- F. Level 5 Finish Requirements.
 - 1. Surfaces scheduled for Level 5 finishes shall be free of visible eye-catching discrepancies and/or blemishes from a normal viewing distance under lighting conditions equal to daylight and artificial light condition for each surface.
 - a. Proprietary skim coat material, applied at a rate of 100 to 125 sf per gallon, may be used in lieu of joint compound as skim coat at surfaces indicated for Level 5 finish.

3.5 TOLERANCES

- A. Install gypsum board with 1/8 inch in 10 feet maximum variation from plane in any direction.

END OF SECTION

CHASE
SECTION 093100 – THIN-SET TILING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Ceramic, porcelain, glass and natural stone tile for interior finish applications.
- B. Trim tile and accessories.
- C. Non-tile trim and accessories, including metal level and material transition trims installed as part of tile installations.
- D. Tile adhesives.
- E. Grout.
- F. Grout sealer.

1.2 RELATED SECTIONS

- A. 033000 – Cast-In-Place Concrete
- B. 079200 – Sealants
- C. 092900 – Gypsum Board
- D. 096500 – Resilient Flooring
- E. 096813 – Tile Carpeting
- F. 102801 – Toilet and Utility Room Accessories

1.3 REFERENCES

- A. ANSI A108 Series/A118 Series/A136.1 – *American National Specifications for the Installation of Ceramic Tile*; American National Standards Institute; current edition.
- B. TCNA (HB) – *Handbook for Porcelain Tile Installation*; Tile Council of North America, Inc.; current edition.
- C. USGBC LEED-NC – *LEED Green Building Rating System for New Construction and Major Renovations*; U.S. Green Building Council; current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: For each type of each product, provide manufacturers' data sheets. Include instructions for using grouts and adhesives.
- C. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 FIELD CONDITIONS

- A. Maintain ambient and substrate minimum temperature of 50 degrees F and maximum of 90 degrees F during installation of mortar materials.
- B. For ambient temperatures above 70 degrees F, do not spread more grout than can be cleaned within 30 minutes of the grout firming.

1.6 MAINTENANCE

- A. Furnish 10% attic stock; coordinate with manufacturer for delivery.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Emser Tile Inc.; refer to drawings for contact information; www.emser.com

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- B. Stone Source; refer to drawings for contact information; www.stonesource.com
- C. Substitutions: Not permitted.

2.2 MATERIALS

- A. Tile, grout, grout sealer, and other accessories and trim as indicated in the Drawings:
 - 1. Interior Finish Materials Schedule.
 - 2. Floor Transition Types details.
 - 3. Flooring Transition Finishes Schedule.

2.3 ADHESIVE MATERIALS

- A. Epoxy Adhesive: ANSI A118.4 or A118.15 Modified Dry-Set Cement Mortar.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and adjoining construction, and conditions under which tile work shall be installed.
 - 1. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units, and similar items located in or behind tile has been completed before installing tile.
 - 2. Surfaces to receive tile shall be plumb, level, and true with square corners. Maximum variation from proper planes shall be:
 - a. Sub-floor Surfaces: 1/8" (3 mm) in 10'-0" (3000 mm).
 - b. Vertical Surfaces: 1/8" (3 mm) in 8'-0" (2400 mm).
 - 3. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds.
 - 4. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
 - a. Moisture content: Measure moisture content of surfaces using an electronic moisture meter. Do not apply tile unless moisture content of surfaces are below the following maximums:
 - 1) Gypsum Board: 12 percent.
 - 2) Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3) Interior Wood: 15 percent.
 - b. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture kit for 72 hours.
 - c. Alkalinity: pH range of 7-9.
- B. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.2 PREPARATION

- A. Protect adjacent surfaces during work of this Section.
- B. Prepare substrates to receive tile:
 - 1. Grind or fill concrete substrates as needed to comply with TCNA allowable variations.
 - 2. At locations where concrete has been sealed or otherwise finished, scarify concrete substrates with rotary grinder as may be needed to completely remove curing compounds or other substances that would interfere with tile adhesive. Rinse with water to remove grinding laitance and maintain substrate in a damp condition for application of bond coat and tile.
 - 3. Fill cracks, holes, and depressions with leveling and patching compound according to tile adhesive manufacturer's instructions. Use product specifically recommended by the adhesive manufacturer.
 - 4. Remove protrusions, bumps, and ridges by sanding or grinding.
 - 5. Gypsum board wall surface shall be in proper condition and installed to allow for proper alignment of tile. Screw heads under areas to receive tile applied over water-resistant gypsum board shall not be treated with joint compound prior to tile adhesive application.

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SECTION 093100 – THIN-SET TILING

- C. Preparatory treatments of substrates shall be in compliance with adhesive manufacturer recommendations.
- D. Blending:
 - 1. For tile exhibiting color variations within ranges selected during sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples.
 - 2. If not factory blended, blend tiles on-site before installing, such that the range of color and pattern variation is distributed evenly throughout the job.

3.3 INSTALLATION

A. GENERAL

- 1. Comply with manufacturer's instructions for installation of each material, ANSI A108.1 through A108.13, and TCNA requirements. Tile installation shall comply with requirements as set forth in *TCNA Handbook for Ceramic Tile Installation*.
 - a. Slabs-On-Grade: Thin set; TCNA F113, dry-set or latex-portland cement bond coat, with standard grout.
 - b. Structure-Supported Slabs: Thin set; TCNA F122, dry-set or latex-portland cement bond coat, with standard grout.
 - c. Walls- Dry Areas: Thin set over water-resistant gypsum board; TCNA W242, dry-set or latex-portland cement bond coat, with standard grout.
- 2. Coordinate setting of tile with installation of accessory items to provide neat installation with minimum cutting and symmetrical conditions wherever possible. Perform cutting and drilling without marring visible surfaces.
- 3. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown.
- 4. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- 5. Accurately form intersections and returns. Carefully grind edges of tile abutting trim, finish or built in items. Fit tile closely to outlets, piping and other penetration so that plates, collars, or covers overlap tile.
- 6. Jointing Pattern:
 - a. Lay tile to pattern indicated in the drawings, with the pattern starting at the indicated start points.
 - b. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting to avoid tiles less than one half size.
 - c. Do not interrupt tile pattern through openings.
 - d. Align joints when adjoining tiles on floor, base, walls and trim are same size, or when regular alignment is otherwise possible.
 - e. Provide uniform joint widths as recommended by tile manufacturer.
- 7. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints with penetration centerlines.
- 8. Set tile to integrated joint spacer that ensures a uniform joint of 3/16", subject to variation in tile size tolerance.
- 9. Maintain minimum of 2/3 of joint depth open for grouting.
- 10. Average tile contact area with adhesive shall be not less than 80%.
- 11. Install trim in accordance with manufacturer's instructions.
- 12. Where tile abuts softer flooring materials, provide metal transition strip as specified in the drawings to help prevent edge chipping caused by impact.
- 13. Solidly embed tiles in adhesive so that the top of tiles and transition strips are flush.
- 14. A certain amount of lippage is unavoidable with thin-set applications; however, maximum variation between individual tile units shall be no more than 1/32" (0.8 mm).
- 15. Stone tiles for each room shall be selected to harmonize in color, vein patterns, and physical characteristics. Abrupt and unsightly variations shall not be acceptable. Set stone tile with veining organized in a consistent pattern as approved by Architect.
- 16. Sound tile after setting. Replace hollow sounding units.
- 17. Allow tile to set for a minimum of 48 hours prior to grouting.

B. THIN-SET TILE ADHESIVE

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SECTION 093100 – THIN-SET TILING

1. Dampen surface to receive tile units if very dry; do not saturate.
2. Set tile units before skinning occurs. If skinning does occur, scrape off and replace with fresh adhesive.

C. TRANSITION STRIPS

1. Install metal flooring transitions as indicated in the drawings. Where flooring level change exceeds the transition dimension indicated in the drawings, request Architect of Record to provide additional direction in order to maintain accessibility compliance.
2. Trowel thin set mortar over area where flooring transition shall be placed.
3. Press perforated anchoring leg of profile into mortar and align.
4. Trowel additional adhesive over perforated anchoring leg to ensure full coverage and support of tile edges.

D. GROUT

1. Fill joints with grout. Use standard grout unless otherwise indicated. Install grout to comply with ANSI A108.10
2. Do not use sanded grout or add sand to grout when grouting polished stone, agglomerates, and ceramic tiles with soft glazes. Check manufacturer's literature and test grout on a separate sample area prior to grouting.
3. Tile shall be firmly set before grouting, allow a minimum of 48 hours.
4. Remove tile adhesive from faces and edges of tile prior to applying grout.
5. Grout joints shall be compacted and free of voids and gaps. Joints shall be filled with grout material a minimum of 2/3 thickness of tile. Grout joints shall be watertight, without voids, cracks, excess mortar, or excess grout. Finished joint shall be uniform in color, smooth, without pinholes or low spots.
6. Clean joints and wipe smudges from tile face with a damp towel.
7. Curing:
 - a. Follow grout manufacturer's instructions for curing polymer modified tile grout.
 - b. Moisture cure portland cement grout for a minimum of 72 hours or as required to sufficiently hydrate cement.
 - c. Shade curing grout areas completely from direct or glass-filtered sunlight to prevent rapid evaporation.

E. GROUT SEALER

1. Allow grout to cure for 72 hours prior to sealer application.
2. Clean tile and grout surface free of waxes, sealers and finishes, and allow to thoroughly dry.
3. Apply sealer per manufacturer's instructions.

3.4 CLEANING

1. 1. Remove grout residue from tile as soon as possible.
2. 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Close and tightly seal partly used adhesive containers and store protected in well-ventilated fire-safe area at moderate temperature.

3.5 PROTECTION

- A. Close tiled areas to traffic of any type until setting and grouting materials have cured to manufacturer's recommendations.
- B. Protect walls from impact, vibrations and heavy hammering on adjacent and opposite walls for at least 14 days following installation.
- C. Apply coat of neutral protective cleaner to completed tile walls and floors when recommended by tile manufacturer.
- D. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

CHASE
SECTION 093100 – THIN-SET TILING

END OF SECTION

CHASE
SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical panel units.

1.2 RELATED SECTIONS

- A. 079200 – Joint Sealants: Acoustical sealant.
- B. Division 23 – Heating, Ventilating, and Air Conditioning: - Air diffusion devices in ceiling.
- C. Division 26 – Electrical: Light fixtures and speakers in ceiling system.

1.3 REFERENCES

- A. ASTM 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2004.
- B. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2006.
- C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 1998 (Reapproved 2005).
- D. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

- A. Refer to Section 013000 for submittal procedures.
- B. Product Data: Provide data on suspension system components.
- C. Samples: Submit two samples 12 x 12 inch in size illustrating material and finish of each acoustical panel unit.
- D. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

1.5 QUALITY ASSURANCE

- A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL for the fire resistance indicated.
- B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years experience.
- C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years experience.

1.6 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.7 PROJECT CONDITIONS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustical units after interior wet work is dry.

1.8 EXTRA MATERIALS

- A. See Section 016000 for additional provisions.

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

- B. Furnish 10 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 - PRODUCTS

2.1 ACOUSTICAL UNITS

- A. Manufacturer: refer to drawings.
- B. Acoustical Units
 - 1. General: ASTM E 1264, Class A.
 - 2. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly the suspension system is a part of.
 - 3. Type ACT-2 Acoustical Panels: Plastic faced mineral fiber, ASTM E 1264 Type IV, as specified on the drawings.
 - 4. Type ACT-4 Acoustical Panels: Plastic faced mineral fiber, ASTM E 1264 Type IV, as specified on the drawings.

2.2 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- B. Type ACT-2: non-customer areas.
 - 1. Refer to drawings for product manufacturer, model, and finish.
 - 2. Fire-rated exposed steel suspension system: formed galvanized steel, commercial quality cold rolled; Intermediate-duty.
 - 3. 24" x 24" flat acoustical panel in fully exposed 9/16" tee grid.
- C. Type ACT-4: customer areas.
 - 1. Refer to drawings for product manufacturer, model, and finish.
 - 2. Fire-rated exposed steel suspension system: formed galvanized steel, commercial quality cold rolled; Intermediate-duty.
 - 3. 48" x 48" flat acoustical panel in fully exposed 9/16" dimensional reveal tee grid set in an alternating 48" and 6" linear pattern with continuous mechanical and light fixtures in the 6" channels.

2.3 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Perimeter Moldings:
 - 1. Same material and finish as grid provide matching profile molding for system at same elevation as face of grid.
- C. Metal channel panels: 6" nominal width metal panels by the grid system manufacturer.
 - 1. Finished to match the grid.
 - 2. field-cut to infill the channel ends between light and mechanical fixtures and the perimeter molding.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636 and manufacturer's instructions and as supplemented in this section.

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Miter corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units: Make field cut edges of same profile as factory edges. Paint exposed cut surfaces to match face color.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.
- I. Install hold-down clips on panels within 20 feet of an exterior door.

3.4 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

CHASE
SECTION 096513 - RESILIENT WALL BASE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Resilient wall base.
- B. Resilient wall base installation materials.

1.2 RELATED SECTIONS:

- A. 093100 – Thin-Set Tiling
- B. 096813 – Tile Carpeting
- C. 099100 – Paints

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.
 - 2. ASTM F 137, Standard Test Method for Flexibility of Resilient Flooring Materials; current edition.
 - 3. ASTM E 648, Standard Test method for Critical Radiant Flux; current edition.
 - 4. ASTM F 1515, Standard Test Method for Measuring Light Stability of Resilient Flooring; current edition.
 - 5. ASTM F 1861, Standard Specification for Resilient Wall Base, Type TP (thermoplastic rubber) or Type TV (thermoplastic vinyl); current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plan. Include product schedule with designations indicated on drawings.
 - 1. Verification Samples: Submit two samples, 12 inch length, illustrating profile and color, for each resilient wall base product specified.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 QUALITY ASSURANCE

- A. Installer qualifications.
 - 1. Company specializing in installing the products specified in this section with minimum 5 years of experience.
 - 2. Employs skilled workers who install products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Provide resilient products with mockups specified in other Sections.

1.6 WARRANTY

- A. Manufacturer shall warranty the installed materials against manufacturing defects for 2 years.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- B. Store roll materials as directed by manufacturer to avoid damage.

CHASE
SECTION 096513 - RESILIENT WALL BASE

1.8 FIELD CONDITIONS

- A. Install resilient products after other finishing operations, including painting, have been completed.
- B. Maintain ambient temperatures within range recommended by Johnsonite, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during installation and for 48 hours before and after installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by Johnsonite, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

- A. Manufacturer: as scheduled on drawings
 - 1. Wall base for carpet, thin-set tile, and similar flooring.
 - a. 4.5" wedge-shaped vinyl wall base with 0.25" backside spacer tab.
 - b. Color as indicated on drawings.
 - c. Optionally include manufacturer's pre-formed corners.
 - 2. Wall base for vinyl sheet, VCT, and similar flooring.
 - a. 4.5" wedge-shaped vinyl wall base without spacer tab.
 - b. Color as indicated on drawings.
 - c. Optionally include manufacturer's pre-formed corners.
 - 3. Wall base for painted or sealed concrete flooring.
 - a. 4" flat vinyl wall base with integral cove.
 - b. Color as indicated on drawings.
 - c. Optionally include manufacturer's pre-formed corners.
- B. Physical and performance characteristics.
 - 1. Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP (thermoplastic rubber) or Type TV (thermoplastic vinyl), Group 1.
 - 2. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
 - 3. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
 - 4. Flexibility: Does not crack, break, or show any signs of fatigue when bent around a 1 1/4" diameter cylinder when tested according to ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocols.
 - 5. Color Stability: Meets or exceeds ASTM F 1861 requirements for color stability when tested to ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols.
- C. Substitutions: not permitted.
- D. Color and pattern: refer to drawings. If not specified, refer to Submittals section above.

2.2 INSTALLATION MATERIALS

- A. Leveling and patching compound: Trowelable latex-modified, Portland-cement-based formulation.
- B. Adhesives: as recommended by manufacturer for specific site conditions and substrates.

2.3 ACCESSORIES

- A. Base manufacturer's preformed corners (optional).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

CHASE
SECTION 096513 - RESILIENT WALL BASE

- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient wall base.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT WALL BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Preformed corners: Where manufacturer's pre-formed corners are utilized, install preformed corners before installing straight pieces.
- G. Job-formed corners:
 - 1. Form corners by following manufacturer's included instructions.
 - 2. Outside corners: Form by bending without producing discoloration (whitening) at bends.
 - 3. Inside corners: Butt one piece to corner then scribe next piece to fit.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

CHASE
SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.2 RELATED SECTIONS

- A. 096500 – Resilient Flooring: Resilient base.

1.3 REFERENCES

- A. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; current edition.
- B. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; www.carpet-rug.org; current edition.
- C. CRI (GLC) - Green Label Testing Program - Approved Product Categories for Carpet; www.carpet-rug.org; current edition.
- D. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; www.carpet-rug.org; current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on drawings.

2.2 MATERIALS

- A. As scheduled on drawings.
- B. Manufactured in one color dye lot, and as indicated on drawings.
- C. C.VOC Content: Provide CRI Green Label Plus certified product; in lieu of labeling, independent test report showing compliance is acceptable.

2.3 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: As indicated on the drawings.
- C. Adhesives: Acceptable to carpet manufacturers, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.
- D. Contact Adhesive: Compatible with carpet material, releasable type.

CHASE
SECTION 096813 - TILE CARPETING

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- B. Verify that concrete sub-floor surfaces are ready for carpet tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
 - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 - 2. Alkalinity: pH range of 7-9.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in pattern as scheduled.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

CHASE
SECTION 097200 – WALL COVERINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Vinyl wall coverings.
- B. Field application of wall coverings.

1.2 RELATED SECTIONS

- A. 092900 – Gypsum Board
- B. 099100 - Paints

1.3 REFERENCES

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.
- C. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; current edition.
- D. NFPA 101 – Life Safety Code; current edition.
- E. NFPA 286 – Standards Methods of Fire Tests for Evaluating Contributions of Wall and Ceiling Interior Finish to Room Fire Growth; current edition.
- F. FED CCC-W-408D – Federal Specification – Wall Covering, Weight Standards for Type 1, Type II and Type III; current edition.
- G. FED W-101 – Federal Specification – Wall Covering, Vinyl Coated Quality Standard; current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data on all finishing products, including VOC content.
- C. Samples: Submit two samples, 12x12 inch in size illustrating range of pattern for each product scheduled.
- D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of wall covering, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for adhesive.
- C. Wall Coverings: Store at minimum ambient temperature of 60 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the wall covering product manufacturer.

CHASE
SECTION 097200 – WALL COVERINGS

- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Minimum Application Temperatures for wall covering adhesives: 60 degrees F; unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

1.8 EXTRA MATERIALS

- A. See Section 016000 for additional provisions.
- B. Label each roll with color in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide all wall covering products used in any individual system from the same manufacturer; no exceptions.
- B. Wall Coverings:
 - 1. DL Couch: www.dlcouch.com for interior wall coverings.

2.2 ADHESIVES

- A. Use only water-based adhesive having volatile organic compounds not more than 50 g/l.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of State in which the project is located.
 - c. USGBC LEED Rating System, edition as stated in Section 01355; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.3 WALL COVERINGS - INTERIOR

- A. Product:
 - 1. As indicated on drawings.
- B. Color:
 - 1. As indicated on drawings.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Edge Guard Material: Concealed feathered edge, stainless steel; maximum of 1 inch wide.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

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SECTION 097200 – WALL COVERINGS

- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- D. Mix and apply adhesive in accordance with manufacturer's directions.
- E. Prevent adhesive from getting on face of wall covering.
- F. Apply adhesive to wall covering back.
- G. Use wall covering of same batch or run in an area. Use rolls in consecutive numerical sequence of manufacture.
- H. Install wall covering completely adhered, smooth, clean, without wrinkles, air pockets, gaps or overlaps.
- I. Extend wall covering continuous behind non-built-in casework and other items which are close to but not bolted to or touching the walls.
- J. Install wall covering before installation of resilient base. Extend wall covering not more than ¼ inch below top of resilient base.
- K. Install panels consecutively in order in which they are cut from the roll including filling spaces above or below windows, doors, or similar penetrations.
- L. Do not install horizontal seams.
- M. Except on match patterns, hang fabric by reversing alternate strips, except as recommended by the manufacturer.
- N. Cutting: Cut on a work table with a straight edge.
 - 1. Joints or seams that are not cut clean are unacceptable.
 - 2. Trim additional selvage to achieve a color and pattern match at seams. Overlapped seams are not allowed.
 - 3. Cut seams as specified by manufacturer.
 - 4. If double cutting on the wall is necessary, place a three inch strip of TYPE II wall covering under pasted edge.
 - a. Do not cut into wall surface.

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SECTION 097200 – WALL COVERINGS

- b. After cutting, remove strip and excess adhesive from seam before proceeding to next seam.
 - c. Smooth down seam in adhesive for tight bond and joint.
 - O. Trim strip-matched patterns, which are not factory pre-trimmed.
 - P. Inside Corners:
 - 1. Wrap wall covering around corner.
 - 2. Do not seam with 2 inches of inside corners.
 - 3. Cut seam as specified by manufacturer.
 - Q. Outside Corners:
 - 1. Wrap wall covering around corner.
 - 2. Do not seam within 6 inches of outside corners.
 - 3. Cut seam as specified by manufacturer.
 - R. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- 3.4 CLEANING**
- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

CHASE
SECTION 098100 - ACOUSTIC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustical insulation in walls.
 - 2. Acoustical sealant.
- B. Related Sections:
 - 1. 072117 – Fibrous Building Insulation: Thermal batt and blanket insulation.
 - 2. 092200 – Lightgauge Metal Support Framing: Support framing.
- C. Drawings, the provisions of the Agreement, the General Conditions, and Division 1 specification sections apply to all work of this Section.
- D. Substitutions: Substitute products will be considered only under the terms and conditions of Section 016000.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. E84 - Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. See Section 013000 for submittal procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Batt Acoustical Insulation: ASTM C665, Type I; unfaced glass fiber batts, blankets, or rolls; minimum fire hazard classification rating of 25/50 per ASTM E84; minimum 3-inch thick, unless required otherwise to meet the STC requirements; 2-3/4 inches thick for installation in 2-1/2 inch stud cavities; 3-5/8 to 4 inches thick for installation in 3-5/8 inch stud cavities; 6-1/2 inches thick for installation in 6 inch stud cavities; widths to friction-fit between studs, where indicated for installation in stud walls; formaldehyde free.
- B. Mineral Fiber Batt Acoustical Insulation: Thermafiber (Wabash, IN; 888-834-2371; 260-563-2111) "SAFB" (Sound Attenuation Fire Blanket); ASTM C665, Type I; unfaced mineral fiber batts; minimum fire hazard classification rating of 0/0 per ASTM E84; minimum 3-inch thick, unless required otherwise to meet the STC requirements; 2-1/2 inches thick for installation in 2-1/2 inch stud cavities; 3-1/2 to 4 inches thick for installation in 3-5/8 inch stud cavities; 6 inches thick for installation in 6 inch stud cavities; widths to friction-fit between studs, where indicated for installation in stud walls; formaldehyde free.
- C. Acoustical Insulation: ASTM C665, Type I; unfaced glass fiber batts, blankets, or rolls; minimum fire hazard classification rating of 25/50 per ASTM E84; minimum 3-1/2-inch thick, unless required otherwise to meet the STC requirements indicated or specified; formaldehyde free.
 - 1. For Installation in Stud Walls: Widths to friction-fit between studs
 - 2. For Installation at Partition Head Tracks and Acoustically Insulated Door Frames: Continuous strips, full width of partition or frame, as detailed.
- D. Acoustical Sealant: Non-hardening, low-shrinkage; for use in conjunction with gypsum board; similar to USG "Sheetrock Brand Acoustical Sealant," Tremco "Acoustical Sealant 30CTG," Quiet Solution (Sunnyvale CA; 408-541-8000) "QuietSeal QS-350," or approved; maximum VOC content 250g/L.
- E. Accessories: Furnish other accessories such as fasteners and retainers, not specifically described, but required for a complete installation.

CHASE
SECTION 098100 - ACOUSTIC INSULATION

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.
- B. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- C. Do not begin work until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

- A. Verify that adjacent materials are secure, properly spaced, dry, and ready to receive installation.
- B. Verify that mechanical and electrical services within spaces to be insulated have been installed and tested.
- C. Furnish acoustical insulation to hollow metal installer for installation in hollow metal frames in acoustical partitions.

3.3 INSTALLATION

- A. Install insulation in stud cavities in accordance with manufacturer's instructions, and as indicated. Coordinate with other trades as necessary to complete acoustical barriers at wall penetrations.
- B. Install insulation without gaps or voids.
- C. Trim insulation neatly to fit spaces. Use insulation materials free of damage.
- D. Sealant:
 - 1. Install acoustical sealant continuously around perimeter of all acoustically insulated partitions; one continuous bead at each side of framing member interface with substrate.
 - 2. Where double layer of gypsum board is indicated, provide sealant at butt joints between boards , including corner joints, and additional bead at perimeter of base layer prior to installation of finish layer.
 - 3. Except for penetrations in fire rated construction to receive firestopping or fire rated construction joint assemblies, seal all penetrations through acoustical assemblies, including cutouts for lighting fixtures, cabinets, pipes and plumbing, HVAC ducts, and electrical boxes.

END OF SECTION

CHASE
SECTION 099100 - PAINTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically so indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.2 RELATED SECTIONS

- A. 055000 – Metal Fabrications: Shop-primed items.
- B. 062000 – Finish Carpentry
- C. 081113 – Hollow Metal Doors and Frames
- D. 081416 – Flush Wood Doors
- E. 083100 – Access Door and Panels
- F. 092900 – Gypsum Board

1.3 REFERENCES

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; current edition.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; current edition.
- D. GreenSeal GS-11 - Paints; current edition.
- E. NACE (IMP) - Industrial Maintenance Painting; NACE International; Edition date unknown.
- F. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; current edition.

1.4 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.5 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data on all finishing products, including VOC content.
- C. Samples: Submit two samples, 12x12 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

CHASE
SECTION 099100 - PAINTS

- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.9 EXTRA MATERIALS

- A. See Section 016000 for additional provisions.
- B. Supply 1 gallon of each color; store where directed.
- C. Label each container with color in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. Sherwin Williams Company: www.sherwin-williams.com for Exterior painting.
 - 2. PPG Architectural Finishes, Inc: www.ppgaf.com for Exterior painting.
 - 3. Benjamin Moore & Co: www.benjaminmoore.com for Interior painting.

2.2 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

CHASE
SECTION 099100 - PAINTS

- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of State in which the project is located.
 - c. USGBC LEED Rating System, edition as stated in Section 01355; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

2.3 PAINT SYSTEMS - EXTERIOR

- A. Paint EPT-1 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces (corresponds w/EIFS-1)
 - 1. As indicated on drawings.
- B. Paint EPT-2 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces (corresponds w/EIFS-2)
 - 1. As indicated on drawings.
- C. Paint EPT-3 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces
 - 1. As indicated on drawings.
- D. Paint EPT-4 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces.
 - 1. As indicated on drawings.
- E. Paint EPT-5 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces.
 - 1. As indicated on drawings.
- F. Paint EPT-6 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces.
 - 1. As indicated on drawings.
- G. Paint EPT-7 – Exterior Paint – Exterior Aluminum/Galvanized metal surfaces.
 - 1. As indicated on drawings.
- I. Paint EIFS-1 – Exterior Paint at EIFS Surfaces.
 - 1. As indicated on drawings.
- J. Paint EIFS-2 – Exterior Paint at EIFS Surfaces.
 - 1. As indicated on drawings.
- K. Paint EIFS-3 – Exterior Paint at EIFS Surfaces.
 - 1. As indicated on drawings.
- L. Paint EIFS- 4 – Exterior Paint at EIFS Surfaces.
 - 1. As indicated on drawings.
- M. Paint EIFS-5 – Exterior Paint at EIFS Surfaces.
 - 1. As indicated on drawings.
- N. Paint E-Pav - Pavement Marking Paint:
 - 1. Yellow: Two coats, with reflective particles; See plan for locations.
 - 2. White: Two coats, with reflective particles; See plan for locations.

2.4 PAINT SYSTEMS - INTERIOR

- A. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
 - 1. One coat of latex primer sealer.
 - 2. Satin: Two coats of latex; AURA Waterborne Interior Paint 526.
- B. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:

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1. One coat of stain; 250 g/L.
 2. One coat sealer; 250 g/L.
 3. Satin: One coat of varnish; 350 g/L.
- C. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer.
 2. Satin: Two coats of latex; AURA Waterborne Interior Paint 526.
- D. Paint GI-OP-3L - Gypsum Board, Latex, 3 Coat:
1. One coat of latex primer sealer.
 2. Eggshell: Two coats of latex; AURA Waterborne Interior Paint 524.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

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- J. Un-corroded, Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- L. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- M. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.
- D. Sand wood and metal surfaces lightly between coats to achieve required finish.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Finish equipment, piping, conduit, and exposed duct work; as indicated on drawings.
- C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
 - 3. Stainless steel items.
- B. Paint the surfaces described in PART 2, Paint Systems Articles and as indicated on the Drawings.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint shop-primed items occurring in finished areas.

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SECTION 099100 - PAINTS

3. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
4. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

END OF SECTION

CHASE
SECTION 099300 – STAINS AND TRANSPARENT FINISHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Stains and transparent finishes:
 - 1. Surface preparation of substrates.
 - 2. Field and shop application.
- B. Wood repair products.
- C. Scope: Finish all interior and wood surfaces exposed to view, unless fully factory-finished or otherwise indicated as unfinished or for paint finish.

1.2 RELATED SECTIONS

- A. 062000 – Finish Carpentry.
- B. 099100 - Paints

1.3 REFERENCES

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. GreenSeal GS-11 - Paints; current edition.
- C. NACE (IMP) - Industrial Maintenance Painting; NACE International; Edition date unknown.
- D. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; current edition.
- E. American Society for Testing and Materials (ASTM); latest edition unless otherwise noted.
 - 1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - 2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

1.4 QUALITY ASSURANCE

- A. Mock-up: Prior to beginning work, provide a mock-up on-site of a portion of the completed materials and assemblies in-place for each of the finish types designated in the Construction Drawings.
 - 1. Mock-up areas shall be designated by the Architect of Record.
 - 2. Do not proceed with remaining work until the workmanship, color and sheen are approved by the Architect of Record.
 - 3. Re-finish the mock-up area as required to produce a consistent finish with the adjacent areas.

1.5 SUBMITTALS

- A. Refer to Section 013000 for submittal procedures.
- B. Product data: Provide manufacturer's product data on each product to be used, including but not limited to:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Application conditions and methods.
 - 4. Protection, cleaning, touch-up and repair recommendations.
- C. Samples: Submit two 6" x 6" samples for each surface finishing product specified, on a representative sample of wood specie, grade and graining to be finished.
- D. Certification: By manufacturer that all stains and finishes comply with VOC limits specified either in the Construction Drawings or by jurisdictions having authority.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability. Store containers unopened, protected from exposure to weather or direct sunlight, until ready for application.
- B. Container Label: Include manufacturer's name, type of stain or finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the stain or finish product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the stain or finish product manufacturer.

1.9 EXTRA MATERIALS

- A. Refer to Section 016000 for additional provisions.
- B. Supply 1 quart minimum, 1 gallon maximum, of each stain or finish product used; store where directed.
- C. Label each container with color and sheen in addition to the manufacturer's label. Where finishes are applied to specific materials, components or rooms, include notes on application location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers and products shall be limited to those indicated in the Interior Finish Materials Schedule in the Construction Drawings. Substitutions are not permitted.
 - 1. Minwax, Upper Saddle River, New Jersey; 800-526-0495; www.minwax.com.

2.2 MATERIALS- GENERAL REQUIREMENTS

- A. Stains and transparent finishes- general:
 - 1. Unless otherwise indicated, provide factory-mixed materials. Mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin or reduce coatings or add materials unless such procedure is specifically described in manufacturer's product instructions.
 - 2. Supply each material in the quantities required to complete the entire project's work from a single production run.
- B. Back-primer for transparent-finished millwork:
 - 1. Same as finish coat.
 - 2. 1 coat nitrocellulose lacquer sanding sealer.
 - 3. 1 coat vinyl toluene copolymer.
- C. Wood filler: Use one of the following, as appropriate to repair required. Substitutions not permitted.
 - 1. Shallow nicks and scratches: Minwax Blend-Fil Pencil.
 - 2. Minor scratches, gouges and nail holes: Minwax Wood Putty.
 - 3. Gouges, holes, knot holes and damaged areas:
 - a. Two-Part Minwax High Performance Wood Filler.
 - b. Minwax Stainable Wood Filler.

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SECTION 099300 – STAINS AND TRANSPARENT FINISHES

- 4. As reinforcement for decayed wood: Minwax High Performance Wood Hardener.
- D. Stain touch-up: Minwax Wood Finish Stain Marker.
- E. Shellac, lacquer and varnish remover: Minwax Antique Furniture Refinisher.
- F. Application accessories: Provide all cleaning agents, primers, sealers, tools, cleaning cloths, sanding materials, and cleanup materials required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work and work area conditions are as instructed by the product manufacturer. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application. Do not begin work until unsatisfactory conditions are resolved.
- B. Test shop-applied stains or finishes for compatibility with subsequent cover materials.
- C. Measure moisture content of wood application surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Interior: 15%, measured in accordance with ASTM D4442.
 - 2. Exterior: 19%, measured in accordance with ASTM D4442.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to finish application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Stir before and during application as recommended by manufacturer.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Sand lightly between coats to achieve required finish.
- F. Apply without runs, drips, or sags, without brush marks, and with consistent sheen.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

CHASE

SECTION 099400 – NICHHA VINTAGEWOOD

099400

Composite Wall Panels

Part I - General

1.1 SECTION INCLUDES:

- A. Exterior, panelized fiber cement cladding system and accessories to complete a drained and back-ventilated rainscreen.
- B. Interior fiber cement panelized cladding system and accessories.

1.2 RELATED SECTIONS

- A. Section 05 41 00 - Structural Metal Stud Framing
- B. Section 06 10 00 - Rough Carpentry
- C. Section 06 16 00 - Sheathing
- D. Section 07 20 00 - Thermal Protection
- E. Section 07 25 00 - Weather Barriers
- F. Section 07 60 00 - Flashing and Sheet Metal
- G. Section 07 90 00 - Joint Protection

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 509-14 – Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems
- B. ASTM International (ASTM):
 - 1. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 2. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber Cement.
 - a. ASTM C 1186 – Standard Specification for Flat Fiber-Cement Sheets.
 - 3. ASTM E-84 - Standard Test for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 5. ASTM E 228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
 - 6. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 7. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

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SECTION 099400 – NICHHA VINTAGEWOOD

- C. Florida Building Code - Test Protocol HVHZ
 - 1. Testing Application Standard (TAS) 202, 203 – HVHZ Test Procedures
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 285 - Fire Test Method for Exterior Wall Assemblies Containing Combustible Material.
 - 2. NFPA 268 – Ignition Resistance of Exterior Wall Assemblies.
- E. Standards Council of Canada & Underwriters Laboratories Canada (ULC):
 - 1. CAN/ULC S-102 – Standard Method of Test for Surface Burning Characteristics.
 - 2. CAN/ULC S-134 – Standard Method of Fire Test of Exterior Wall Assembly.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Submit manufacturer's product description, storage and handling requirements, and installation instructions.
- C. Product Test Reports and Code Compliance: Documents demonstrating product compliance with local building code, such as test reports or Evaluation Reports from qualified, independent testing agencies.
- D. LEED Credits: Provide documentation of LEED Credits for project certification under USGBC LEED 2009 (Version 3.0) or 2012 v.4.
- E. Manufacturer's Details: Submit drawings (.dwg, .rvt, and/or .pdf formats), including plans, sections, showing installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.
- F. Samples: Submit samples of each product type proposed for use.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. All fiber cement panels specified in this section must be supplied by a manufacturer with a minimum of 10 years of experience in fabricating and supplying fiber cement cladding systems.
 - a. Products covered under this section are to be manufactured in an ISO 9001 certified facility.
 - 2. Provide technical and design support as needed regarding installation requirements and warranty compliance provisions.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained by manufacturer or representative.
- C. Mock-Up Wall: Provide a mock-up wall as evaluation tool for product and installation workmanship.

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SECTION 099400 – NICHIIHA VINTAGEWOOD

D. Pre-Installation Meetings: Prior to beginning installation, conduct conference to verify and discuss substrate conditions, manufacturer's installation instructions and warranty requirements, and project requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation. Do not stack pallets more than two high. Refer to the information included on each pallet.

B. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty.

C. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.

D. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

1.7 WARRANTY

A. Provide manufacturer's 15-year warranty against manufactured defects in fiber cement panels. Additional 5-year extension available when refinished in year 14-15.

B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish.

C. Warranty provides for the original purchaser. See warranty for detailed information on terms, conditions and limitations.

PART II: PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Nichiha Corporation, 18-19 Nishiki 2-chome Naka-ku, Nagoya, Aichi 460-8610, Japan.

B. Acceptable Manufacturer's Representative: Nichiha USA, Inc., 6465 E. Johns Crossing, Suite 250, Johns Creek, GA 30097. Toll free: 1.866.424.4421, Office: 770.805.9466, Fax: 770.805.9467, www.nichiha.com.

1. Basis of Design Product: Nichiha VintageWood.

a. Profile colors: Bark, Cedar, Redwood, Ash, and Spruce.

b. Profiles: Wood plank texture with three, 3/8" grooves running lengthwise, spaced 5-5/8" apart.

c. Accessory/Component Options:

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- i. Manufactured Corners with 3-1/2" returns for each profile color.
- ii. Aluminum trim options: Corner Key, Open Outside Corner, H-Mold, J-Mold, Compression Joint, Inside Corner

- 1. Finish: Bark, Cedar, Clear Anodized, or Primed.

- iii. Essential Flashing System: Starter, Overhang.

- 1. Finish: Matte black.

- d. Dimensions:

- 1. AWP-1818: 455mm (17-7/8") (h) x 1,818 mm (71-9/16") (l).
 - 2. AWP-3030: 455mm (17-7/8") (h) x 3,030 mm (119-5/16") (l).

- e. Panel Thickness: 16 mm (5/8").

- f. Weight: AWP-1818: 35.27 lbs. per panel, AWP-3030: 57.32 lbs. per panel.

- g. Coverage: 8.88 sq. ft. per panel (1818), 14.81 sq. ft. per panel (3030).

- h. Factory sealed on six [6] sides.

C. Substitutions: Not permitted.

D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

A. Fiber cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles.

B. Panel surface pre-finished and machine applied.

C. Panels profiled along 3030mm edges so that the long joints between the installed panels are ship-lapped.

D. Factory-applied sealant gasket added to top panel edge; all 3030mm edge joints contain a factory sealant.

2.3 PERFORMANCE REQUIREMENTS:

A. Fiber Cement Cladding – Must comply with ASTM C-1186, Type A, Grade II requirements:

- 1. Wet Flexural Strength: Result: 1418 psi, Lower Limit: 1015 psi.
- 2. Water Tightness: No water droplets observed on any specimen.
- 3. Freeze-thaw: No damage or defects observed.
- 4. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.
- 5. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.

B. Mean Coefficient of Linear Thermal Expansion (ASTM E-228): Max 1.0×10^{-5} in./in. F.

C. Surface Burning (CAN-ULC S102/ASTM E-84): Flame Spread: 0, Smoke Developed: 0.

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D. Wind Load (ASTM E-330): Contact manufacturer for ultimate test pressure data corresponding to framing type, dimensions, fastener type, and attachment clips. Project engineer(s) must determine Zone 4 and 5 design pressures based on project specifics.

1. Minimum lateral deflection: L/120.

E. Water Penetration (ASTM E-331): No water leakage observed into wall cavity.

F. Steady-State Heat Flux and Thermal Transmission Properties Test (ASTM C-518): 16mm thick panel thermal resistance R Value of 0.47.

G. Fire Resistant (ASTM E-119): The wall assembly must successfully endure 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.

H. Ignition Resistance (NFPA 268): No sustained flaming of panels, assembly when subjected to a minimum radiant heat flux of 12.5 kW/m² ± 5% in the presence of a pilot ignition source for a 20-minute period.

I. Fire Propagation (NFPA 285): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Commercial Wrap, ½" Densglass Gold Sheathing, 16" o.c. 18 gauge steel studs, mineral wool in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of NFPA 285.

J. Fire Propagation (CAN/ULC S-134): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Housewrap, 5/8" FRT plywood, 16" o.c. 2x wood studs, fiberglass in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of CAN/ULC S-134.

K. Drained and Back Ventilated Rainscreen (AAMA 509-14): System classifications: W1, V1.

L. Florida Building Code - Test Protocol HVHZ (TAS 202, 203): Horizontal Application Design Pressure: 95 psf, Vertical Application Design Pressure: 85 psf.

2.4 INSTALLATION COMPONENTS

A. Ultimate Clip System:

1. Starter Track:

- a. Horizontal Panel Installations - FA 700 – 3,030mm (I) galvalume coated steel.
- b. Vertical Panel Installations (AWP-3030 only) – FA 710T – 3,030mm (I) galvalume coated steel.

2. Panel Clips: JEL 778 "Ultimate Clip II" (10mm rainscreen for 16mm AWP) – Zinc-Aluminum-Magnesium alloy coated steel.

- a. Joint Tab Attachments (included) – used at all AWP-1818 panel to panel vertical joints, NOT used with AWP-3030 installations.

3. Corner Clips: JE 777C (10mm rainscreen for 5/8" AWP Manufactured Corners) -- Zinc-Aluminum-Magnesium alloy coated steel.

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4. Single Flange Sealant Backer – FHK 1015 R (10mm) – 6.5' (l) fluorine coated galvalume.
 5. Double Flange Sealant Backer – FH 1015 R (10mm) – 10' (l) fluorine coated galvalume.
 6. Corrugated Spacer – FS 1005 (5mm), FS 1010 (10mm) – 4' (l).
- B. Aluminum Trim (optional): Paint primed trim as specified in finish schedule.
- C. Essential Flashing System (optional):
1. Starter – main segments (3,030mm), inside corners, outside corners
 2. Overhang – main segments (3,030mm), inside corners, outside corners, joint clips
- D. Fasteners: Corrosion resistant fasteners, such as hot-dipped galvanized screws appropriate to local building codes and practices must be used. Use Stainless Steel fasteners in high humidity and high-moisture regions. Panel manufacturer is not liable for corrosion resistance of fasteners. Do not use aluminum fasteners, staples or fasteners that are not rated or designed for intended use. See manufacturer's instructions for appropriate fasteners for construction method used.
- E. Flashing: Flash all areas specified in manufacturer's instructions. Do not use raw aluminum flashing. Flashing must be galvanized, anodized, or PVC coated.
- F. Sealant: Sealant shall comply with ASTM C920, Class 35.

PART III: EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
1. Fiber cement panels can be installed over braced wood, steel studs and sheathing including plywood, OSB, plastic foam (1" or less) or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's) and Concrete Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction. Insulated Concrete Forms (ICFs) require added measures. Consult with Nichiha Technical Services.
 2. Allowable stud spacing: 16" o.c. maximum.
 3. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier (WRB) as defined by the 2015 IBC or IRC. Refer to local building codes.
 4. Appropriate metal flashing should be used to prevent moisture penetration around all doors, windows, wall bottoms, material transitions and penetrations. Refer to local building codes for best practices.
- B. Examine site to ensure substrate conditions are within alignment tolerances for proper installation.
- C. Do not begin installation until unacceptable conditions have been corrected.

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- D. Do not install panels or components that appear to be damaged or defective. Do not install wet panels.

3.2 TOLERANCE

- A. Wall surface plane must be plumb and level within +/- ¼ inch in 20 feet in any direction.

- 1. One layer of Nichiha 5mm (~3/16") Spacer may be used as shim.

3.3 INSTALLATION

- A. General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation.

- 1. Consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building higher than 45 feet or three stories or for conditions not matching prescribed standard installation guide requirements and methods. A **Technical Design Review (TDR)** process is available to evaluate project feasibility.

- 2. **Vertical Control/Expansion Joints** are required with AWP-1818, for walls wider than 30 feet, within 2-12 feet of outside corners finished with metal trim *and* approximately every 30 feet thereafter.

- A. **Vertical Control/Expansion Joints** are required at each AWP-3030 vertical joint, or H-Mold trim may be used instead.

- 3. **Horizontal/Compression Joints** are required for multi-story installations of AWP. Locate joints at floor lines. Joints are flashed minimum ½" breaks. Do not caulk. Refer to installation guide(s).

- A. Wood framed buildings of three or more floors require a compression joint at each floor.

- B. Steel framed buildings (including reinforced concrete core with LGMF exterior walls) of more than three floors (or 45 feet) require a compression joint every 25 feet at a floor line.

B. Panel Cutting

- 1. Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area.
 - 2. Always wear safety glasses and NIOSH/OSHA approved respirator whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer SDS for more information.
 - 3. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade.
 - a. Recommended circular saw: Makita 7-1/4" Circular Saw with Dust Collector (#5057KB).

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b. Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505).

c. Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork.

4. **Silica Dust Warning:** Fiber cement products may contain some amounts of crystalline silica, a naturally occurring, potentially hazardous mineral when airborne in dust form. Consult product SDS or visit <https://www.osha.gov/dsg/topics/silicacrystalline/>.

5. Immediately clean dust from cut panels as it may bind to the finish.

3.4 CLEANING AND MAINTENANCE

A. Review manufacturer guidelines for detailed care instructions.

CHASE
SECTION 102219 – DEMOUNTABLE PARTITION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Structural wall framing system
- B. Wall skins.
- C. Frames for doors and glazed openings.
- D. Doors and door hardware.
- E. Glass and Glazing.
- F. Misc. trims for junctions and building interface.
- G. Modular power, monitor shrouds and other technology interface.
- H. Acoustic insulation

1.2 RELATED SECTIONS

- A. 079200 – JOINT SEALANTS
- B. 081113 – HOLLOW METAL DOORS AND FRAMES
- C. 087100 – DOOR HARDWARE
- D. 088000 – GLAZING
- E. 092900 – GYPSUM BOARD

1.3 PERFORMANCE REQUIREMENTS AND REFERENCE STANDARDS

- A. A. ANSI/BIFMA
 - 1. Wall units will support a maximum load of 331 lbs. per linear foot per side in compliance with ANSI/BIFMA X 5.6.
- B. B. ASTM: American Society for Testing and Materials
 - 1. Wall assemblies shall comply with flammability requirements in accordance with ASTM E84 "Standard Method for Surface Characteristics of Building Materials". This test method is technically equivalent to that specified in NFPA No. 225, UBC No. 8-1, ANSI/UL 723 and ASTM E 84-97.
 - a. Painted steel skins – Class A (Type I)
 - b. Fabric wrapped steel skins – Class A (Type I)
 - c. Veneer skins – Class C (Type III)
 - d. Laminate Skins - – Class C (Type III)
 - 2. All solid and framed glass systems are in compliance with ASTM E 72 "Standard Test Methods of Conducting Strength Tests of Panels for Building Construction".
 - 3. Solid wall sound attenuation capabilities for steel clad skins will range from a minimum (requiring no field additive insulation or gaskets) of 42 STC to a maximum STC level of 52 in accordance with ASTM E 90-90 "Method for Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions". Field cutting of wall skins will not be required to meet specified STC levels. Refer to plans for specific requirements.
 - 4. Solid wall sound attenuation capabilities for veneer and laminate skins will range from a minimum (requiring no field additive insulation or gaskets) of 37 STC to a maximum STC level of 44 in accordance with ASTM E 90-90 "Method for Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions". Field cutting of wall skins will not be required to meet specified STC levels. Refer to plans for specific requirements.
 - 5. Glazed wall sound attenuation capabilities using single glazed frames will range from a minimum of 30 STC with 1/4" tempered glass to 33 STC with 9/32" laminated glass. Refer to plans for specific requirements.
 - 6. Glazed wall sound attenuation capabilities using double glazed frames will range from a minimum of 42 STC with 1/4" tempered glass in both positions to 44 STC with 1/4" tempered glass and 3/8" tempered glass. Refer to plans for specific requirements.

- C. Underwriters Laboratories
 - 1. Pre-wired modular power components shall be UL 183 listed.
 - 2. The wall system shall be UL Certified for compliance with NFP 70 – National Electrical Code and CAN/CSA-C22 No. 1-09 - Canadian Electrical Code.
- D. Sustainability
 - 1. All wall components, including modular power, shall be entirely free of any polyvinyl chloride (PVC) components (with the exception of integral LED lighting components).
 - 2. All wall components shall be independently third-party certified as compliant with the ANSI/BIFMA e3 Sustainability Standard at level 3.
 - 3. Wall components will be Indoor Advantage certified to conform to ANSI/BIFMA Furniture Emissions Standard (M7.1/X7.1-2011) ANSI/BIFMA e3-2012 for the private office workstation parameters.

1.4 SUBMITTALS

- A. Basis of design: V.I.A., as designed and manufactured by Steelcase, Grand Rapids, MI. Other wall systems which meet this criteria may bid providing that all applicable product specifications, details and certified independent laboratory test reports have been submitted and approved by the architect or owner at least 10 working days prior to bid. This submission is to clearly outline areas of compliance and area of failure to comply with function and performance specified. Indication of approval will be by addendum issued by the architect.
- B. Submit detailed shop drawings, showing all elements of the system, including fabrication and installation details, fastenings, accessories, types of material and finishes.
- C. Shop drawings to include product reference detail to link individual wall components to factory orders and packing lists.
- D. Product certification of compliance with specified performance characteristics and criteria, and physical requirements.
- E. Manufacturer's installation and assembly instructions.
- F. Closeout Submittals.
- G. Warranty documents as specified.
- H. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installation shall be by manufacturer's or a qualified dealer's trained personnel.
- B. Supplier shall take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work.

1.6 DELIVERY, HANDLING AND STORAGE

- A. Deliver wall components containerized, cartoned or crated to provide protection during transit. Include with bid any necessary storage precautions required for the product being offered.
- B. Installation shall not commence until building is enclosed and climate controlled, and finishing operations, including adjacent walls, ceiling (including lighting, sprinklers & HVAC), floor-covering and painting, are complete.
- C. Relocatable wall installer to inspect partition components upon delivery for damage. Minor damage may be repaired provided the finish items are equal in all respects to new work and acceptable to the owner's representative. Remove and replace damaged items as described.
- D. It shall be the responsibility of the wall supplier to properly package all components for storage and define storage program to be provided on site by General Contractor at no charge, to ensure product performance.
- E. Relocatable wall components shall be tagged and labeled with identification numbers that correspond to product reference numbers as called out on shop drawings.

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1.7 WARRANTY

- A. Submit manufacturer's standard warranty document. Product shall be covered under limited lifetime warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND MODELS

- A. Steelcase – Grand Rapids, MI 49508 Model: V.I.A.; www.steelcase.com.
- B. DIRT Environmental Solutions Ltd. – 7303 30th Street, Calgary, Alberta, Canada; www.dirtt.net.

2.2 RELOCATABLE WALL SYSTEM

- A. Relocatable, non-progressive, capable of four direction lateral expansion with reusable components.
 - 1. Wall Thickness: 4" nominal.
 - 2. Wall height: As noted on drawings.
 - 3. Vertical and horizontal joinery: 1/4" reveal.
 - 4. Utility Wireways: Provide access through structural framing, junctions, end conditions and utility panels.
- B. Performance Requirements
 - 1. Solid painted wall assemblies to have a Class-A rating in accordance with ASTM E84-97a "Standard Method for Surface Characteristics of Building Materials".
 - 2. All solid and framed glass systems are in compliance with ASTM E 72 "Standard Test Methods of Conducting Strength Tests of Panels for Building Construction".
 - 3. Solid wall sound attenuation capabilities will range from a minimum (requiring no field additive insulation or gaskets) of 42 STC to a maximum STC level of 52.
 - 4. Glazed wall sound attenuation capabilities will range from a minimum of 30 STC to a maximum STC level of 33 for single glazed construction and will range from a minimum of 42 STC to a maximum STC level of 44 for double glazed construction.
 - 5. Solid wall units will support a maximum load of 331 pounds per linear foot per side in compliance with ANSI/BIFMAX5.6.
- C. Wall design will accommodate ceiling heights up to 12'-0".
- D. Solid skins and glass frames shall be vertically oriented up to 142" high or landscape oriented up to 120" wide.
- E. Vertically oriented skins and glass frames shall be a maximum of 60" wide. Landscape oriented skins and glass frames shall be a maximum of 60" high.
- F. Design must permit extension in two, three- or four-way conditions without removal of adjacent panels or floor track.
- G. All solid and fabric skins shall be capable of field cutting to accommodate end filler conditions or other modifications to overall partition length.
- H. The system shall provide a 3" vertical adjustment (+/-1 1/2 ") in overall height to accommodate floor and ceiling irregularities, allowing for a maximum of +/- 3/4 " at the floor and +/- 3/4 " at the ceiling, including wall assemblies, doors and door frames.

2.3 WALL COMPONENTS

- A. Solid skins shall be 3/4" thick, with surfaces of powder coat painted steel (22 gauge), fabric wrapped steel, veneer, or laminate (LPL or HPL), enclosing a particle board substrate.
- B. Markerboard skins will be clad with ceramic steel dry-erase surfaces.
- C. Markerboard skin options to include embedded technology for interacting with projectors and computers.
- D. Skin options to include slatwall for mounting of accessories and worktools.
- E. Monitor shrouds will allow for surface mounting of display monitors with minimal projection from face of wall.

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1. Different monitor sizes can be used without changing wall components.
 2. Monitors will not be enclosed behind glass for ease of accessibility.
 3. Shrouds will include a minimum of two internal simplex receptacles for power.
 4. Shrouds will allow for internal data terminations.
 5. Monitors are not included.
- F. End fillers for relocatable wall adjacent to fixed walls and columns shall be similar in construction to solid wall skins and fit into end channel on the abutting wall. End channels and Mini-ends will include a continuous light and sound seal.
- G. End fillers may utilize solid skins that are field cut to narrower unit width as indicated on drawings. Cut skins will be manufactured in the same manner and with same materials as all other solid skins.
- H. Skins, glass frames and corresponding framing elements shall be manufactured in widths as indicated on shop drawings.
- I. Solid skins and glass frames shall be mounted to structural frame by engaging an operable mechanical bracket that securely engages the framing components. The mechanical bracket will be designed to ensure that un-engaged brackets are easily identified.
- J. The installation and removal of solid skins shall require a special tool to limit accessibility to authorized personnel and to ensure security.
- K. Solid skins shall be removable for access to wall cavity to facilitate electrical installation and inspection.
- L. Solid skins shall be interchangeable with glass frames of equal sizes, and vice versa.
- M. Wall structure to accommodate integral lighting fixtures as provided by the relocatable wall manufacturer.

2.4 STRUCTURAL FRAMING COMPONENTS

- A. Structural framing posts will include a threaded leveler for adjusting to floor variations.
- B. Ceiling track shall be one-piece continuous formed steel with continuous factory installed resilient light and sound.
- C. Primary structural components will be formed of 16-gauge steel.
- D. Horizontal and vertical framing components will be joined with 11-gauge corner brackets.
- E. Vertical structural framing components shall incorporate integral slotting for direct mounting of panel-hung components on either or both sides of the wall, including side-by-side mounting. Continuous seals will conceal all slots. Structural framing components shall allow for direct mounting of panel-hung furniture without the need for any additive, field installed components. Structural framing can accommodate the direct interface of overhead storage and shelving without the use of any additional adapter/transition brackets.
- F. Slotting will allow for wall mounted components to be positioned vertically at 1" increments from 18" to 120" AFF.
- G. The system shall allow for installation on hard surface, or carpeted flooring, without the use of mechanical fasteners (in non-seismic applications).
- H. The system can be installed to the underside of suspended ceilings without the use of destructive fasteners, with a one-piece continuous steel ceiling track.
- I. Structural framing elements will be factory prepared for all connections and joinery hardware, and pre-punched for cable management.
- J. Structural posts will be factory punched to optimize all required segmentation configurations, so that posts are interchangeable and share common hole locations.
- K. Framing components to include factory applied polypropylene gaskets to serve as light and sound seals between the relocatable wall and fixed architectural elements.

2.5 DOOR COMPONENTS

- A. Butt hinge door frames shall be reversible, allowing the installer to change the door swing as part of the installation process.
- B. Butt-Hinged door frames shall be formed steel and aluminum and shall include continuous resilient sound seal at side and top jambs. Frame shall be designed to provide vertical adjustment to compensate for floor and ceiling irregularities without the need to cut doors on site. Frames shall be mortised and reinforced for hardware as specified in section 081113 – Hollow Metal Doors and Frames.
- C. Wall manufacturer to provide offset hinges for planar alignment of door with corridor side of wall.
- D. Reversible door frames and door leaves to be capable of receiving automatic door bottoms for improved sound control.
- E. Slide Door Units shall include fascia, header and track, finished opening frame, and sliding door. Track Shall be aluminum. Roller assemblies will be steel, with high quality ball bearing wheels. Hardware assembly to include pneumatic braking mechanism.
- F. Slide door frames and door leaves to be capable of receiving automatic door bottoms for improved sound control.
- G. Slide door track will be fully supported by wall structure, without requiring additional structural support from other architectural elements.
- H. Solid door leaves shall be 1-3/4" thick; available in wood particleboard core with factory finished medium density overlay face or veneer. Doors shall be pre-finished and pre-mortised for hardware specified in section 087100 – Door Hardware.
- I. Polished glass doors to be 1/2" thick tempered glass. Doors shall be prepared and pre-drilled for hardware as specified in section 088000 – Glazing.
- J. Hardware shall be furnished and installed by the relocatable wall manufacturer.
- K. The following hardware is to be furnished and installed by the relocatable wall contractor:
 - 1. Steelcase offset hinges for reversible door frame.
 - 2. Slide door track, hardware, door pull and/or lock.
- L. Hardware finish shall be specified in section 088000 – Glazing.
- M. Cylinders and cores that are configured to specific master-key requirements will be provided and installed by others – see section 087100 – Door Hardware.

2.6 GLAZED OPENING COMPONENTS

- A. All glass frames to be flush glazed.
- B. Captured glass frame assemblies shall accommodate single glazed or double-glazed configurations. Single glazed assemblies shall be capable of retrofit to double glazed, and vice-versa.
- C. The structural frame and glass frame configuration will allow for glass frames to be exchanged for solid skins and vice-versa, without having to alter the structural frame components.
- D. Captured glass frames shall be pre-glazed prior to arriving at site.
- E. All glass framing components will be constructed of extruded aluminum, either powder coat paint and/or clear anodized as called for in finish schedule.
- F. All glass and glazing for relocatable walls shall be furnished under this section.
- G. All unitized glass shall be factory installed using extruded non-PVC glazing strips. Foam tape or PVC glazing is not acceptable.
- H. All glass shall comply with Federal Safety Standard for Architectural Glazing Materials (16 CFR, Part 1201).
- I. Glass Types: refer to Section 088000 – Glazing, 2.2 Interior Clear Flat Glass Units.

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2.7 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Relocatable wall construction shall allow for field installation of modular and/or hardwired electrical components.
- B. Modular power shall be furnished under this section and shall include:
 - 1. UL 183 4-circuit, 8-wire prefabricated/pre-wired power distribution system.
 - 2. The modular power system shall be comprised of power blocks, receptacles, power harnesses and infeeds.
 - 3. Modular power system shall be electrified by using either a floor infeed, top infeed, or power harness. Top infeed preferred, unless noted otherwise on the Drawings.
 - 4. The modular power block shall provide for the insertion of receptacles of either the same or different circuits.
 - 5. Modular power components will allow for modular electrical receptacles, such that the circuit assignment for any termination can be easily changed by exchanging modular receptacles.
 - 6. Modular power receptacles will include an acoustical back-box to minimize sound transmission at power cutouts and terminations.

2.8 MATERIALS

- A. All metal painted panel surfaces, glass frames, doorframes, base trim and ceiling track will be cold-formed steel or extruded aluminum.
- B. B. Where noted in drawings, aluminum will be extruded aluminum (6063-T6 Aluminum alloy) with a clear anodized finish.
- C. All glass shall comply with Federal Safety Standard for Architectural Glazing Materials (16 CFR, Part 1201).
- D. Light and sound seals to be polypropylene.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that building conditions are ready to receive wall components and that field measurement dimensions are as indicated on shop drawings.
- B. Verify that floor level does not vary by more than plus/minus $\frac{3}{4}$ " from specified height.
- C. Verify that ceiling level does not vary by more than plus/minus $\frac{3}{4}$ " from specified height.
- D. Verify that adjacent surfaces do not exceed 1/8 inch in 8'-0" variation from plumb.
- E. Verify that floor flatness complies with the American Concrete Institute (ACI) floor flatness (FF) requirements per AC117 and ASTM E1155 for Moderately Flat floors (maximum of 3/8" gap over 90% of samples and 5/8" gap over 100%).

3.2 INSTALLATION

- A. Walls shall be installed without permanent fastenings to the unfinished concrete slab with shims as required to level the bottom track, or over finished floor tile, carpeting or raised floor (unless required otherwise for door/hardware operation, or to meet structural or code requirements).
- B. Partition shall be scribed and neatly fitted to existing building conditions all in accordance with details approved on shop drawings.
- C. Installer to provide touch-up of all nicks and scratches that may occur to the wall during handling and installation with touch up paint supplied by the manufacturer in matching color.
- D. Installation shall not commence until building is enclosed and finishing operations, including ceiling, floor-covering and painting, are complete.

3.3 CLEANING

- A. Upon completion of work, this contractor shall remove all of his cartons, trash, crates, etc. and leave the premises broom clean.

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- B. Washdown of walls shall not be part of this section, but shall be considered normal pre-occupancy cleaning responsibility of G.C.

3.4 MAINTENANCE

- A. It shall be the responsibility of the relocatable wall bidder to include in this proposal, the location of the nearest service facility established to service occupant changes of material requirements.

END OF SECTION

CHASE
SECTION 102600 – CORNER GUARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Corner Guards
- B. Mounting hardware, accessories and trim.

1.2 RELATED SECTIONS

- A. 92843 – Gypsum Sheathing
- B. 92900 – Gypsum Board
- C. 97200 – Wall Coverings

1.3 REFERENCES

- A. ANSI/UL 2079 - Standard for Tests for Fire Resistance of Building Joint System.; current edition.
- B. ASTM A 176 – Standard Specification for Stainless and Heat Resisting Chromium Steel Plate, Sheet, and Strip; current edition.
- C. ASTM E84 – Standard Test Method of Surface Burning Characteristics of Building Materials; current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide manufacturer's complete and current product data for each product required, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Complete installation methods.
- C. Samples: Color charts consisting of actual product pieces, demonstrating full range of available color, for initial color selection.
- D. Shop drawings: Show locations of each item and installation details, including mounting and anchorage. Provide elevations of non standard conditions.
- E. Verification Samples: For each product specified, two 8 inch long assemblies, including one end cap, in actual colors and materials specified.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

1.7 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the corner guard product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

1.8 EXTRA MATERIALS

- A. See Section 016000 for additional provisions.

CHASE
SECTION 102600 – CORNER GUARDS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide all corner guard products used in any individual system from the same manufacturer; no exceptions.
- B. Corner Guards:
 - 1. KoroGuard: Stainless Steel Corner Guard, 90 degree angle, 1 inch wing size; www.korogard.com
 - 2. C.R. Laurence Co, Inc: Stainless Steel Corner Molding, 90 degree angle, 3 / 4 inch wing size; www.crlaurence.com
 - 3. Wallguard: Stainless Steel Corner Guard. 90 degree angle, 1 inch wing size; www.wallguard.com

2.2 ADHESIVES

- A. Use only water-based adhesive having volatile organic compounds not more than 50 g/l.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of State in which the project is located.
 - c. USGBC LEED Rating System, edition as stated in Section 01355; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

3.3 APPLICATION

- A. General: Install products level and plumb, in full compliance with manufacturer's installation instructions.

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SECTION 102600 – CORNER GUARDS

3.4 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Verify that products are plumb and rigidly secured to substrate; make any adjustments required.
- C. Clean products and immediate areas of installation, using materials and methods recommended by manufacturer. Remove from project site packaging and debris caused by installation.

END OF SECTION

CHASE
SECTION 102801 – TOILET AND UTILITY ROOM ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Accessories for toilet rooms and utility rooms.
- B. Grab bars.
- C. Mirrors.

1.2 RELATED SECTIONS

- A. 061000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.

1.3 REFERENCES

- A. ASTM A123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; current edition.
- B. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; current edition.
- C. ASTM A653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; current edition.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; current edition.
- F. ASTM C1036 - Standard Specification for Flat Glass; current edition.
- G. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; current edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

1.5 COORDINATION

- A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Refer to the Restroom Accessories Schedule in the Drawings.
- B. Substitutions: not permitted.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide two keys for each accessory to Owner; master key all lockable accessories.
- C. Stainless Steel Sheet: ASTM A 666, Type 304.
- D. Stainless Steel Tubing: ASTM A 269, Type 304 or 316.
- E. Mirror Glass: Float glass, ASTM C 1036 Type I, Class 1, Quality Q2, with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with GSA CID A-A-3002.
- F. Adhesive: Two component epoxy type, waterproof.

CHASE

SECTION 102801 – TOILET AND UTILITY ROOM ACCESSORIES

- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

2.4 TOILET ROOM ACCESSORIES

- A. Waste Receptacle: Wall-mounted, stainless steel.
 - 1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of 4 points with stainless steel grommets and hooks.
 - 2. Product: As scheduled on drawings.
- B. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
 - 1. Size: as scheduled on drawings
 - 2. Frame: 0.05 inch one piece stainless steel channel shapes, with mitered corners; bright polished finish.
 - 3. Backing: Full-mirror sized, shock-absorbing, water-resistant, nonabrasive, minimum 1/8 inch thick polyethylene padding.
 - 4. Product: as scheduled on drawings.
- C. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, satin finish, exposed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on drawings.
 - 2. Product: as scheduled on drawings.

2.5 UTILITY ROOM ACCESSORIES

- A. Mop and Broom Holder and separate Hose Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
 - 1. Mop and Broom Holder: 3 spring-loaded rubber cam holders.
 - 2. Product: Three station mop holder Elkay LK403.
 - 3. Product: One station hose holder Elkay LK404.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

- A. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

END OF SECTION

PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.2 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; current edition.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.3 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide extinguisher operational features and cabinet physical dimensions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 - PRODUCTS**2.1 FIRE EXTINGUISHERS**

- A. Comply with product requirements of NFPA 10 and applicable codes enforced by jurisdictions having authority, whichever is more stringent.
- B. Provide extinguishers labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.
- C. Extinguishers shall not contain CFC's or HCFC's.
- D. Extinguishers shall be constructed of a heavy-duty steel tank, with pressure gage.
- E. Minimum extinguisher rating: 4-A: 80-B:C.

2.2 FIRE EXTINGUISHER CABINETS

- A. Cabinets shall be sized to accommodate the required fire extinguisher.
- B. Cabinets shall include a full-view frameless door with handle. Door glazing shall be 3/16" clear acrylic.
- C. Cabinet **interior surfaces** shall be white powder-coated or enamel painted steel with right-angle inside corners and seams ground smooth.
- D. Cabinet door shall be free of lettering.
- E. Cabinets **exposed to customer view**.
 - 1. Fully recessed cabinet type preferred; semi-recessed type shall be installed where wall thickness will not accommodate a fully recessed cabinet.
 - 2. Cabinet **exterior surfaces** shall be right-angle formed #4 **stainless steel** sheet; 0.036 inch thick minimum.
- F. Cabinets **concealed from customer view**.
 - 1. Cabinet type shall be semi-recessed.
 - 2. Cabinet **exterior surfaces** shall be right-angle formed **powder-coated white steel** with right-angle corners and seams ground smooth.

2.3 MANUFACTURERS

1. JL Industries, Inc.; www.jlindustries.com.
 - a. Extinguisher: Cosmic 10E.
 - b. Recessed cabinet in customer view: Panorama #1035.
 - c. Semi-recessed cabinet in customer view: Panorama #1036.
 - d. Cabinet not in customer view: Panorama #1016.
2. Larsen's Manufacturing Co.; www.larsensmfg.com:
 - a. Extinguisher: MP10.
 - b. Recessed cabinet in customer view: Gemini #SS-G2409-R2.
 - c. Semi-recessed cabinet in customer view: Gemini #SS-G2409-6R.
 - d. Cabinet not in customer view: Gemini G-2409-6R.
3. Substitutions: refer to Section 016000.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Cabinet shall be positioned to provide 48" wide x 30" deep side-approach accessibility clearance area along an accessible path of travel, mounted such that the top of the fire extinguisher handle (not the cabinet handle) is no higher than 3'-10" above the finished floor.
- C. Install cabinets plumb and level in wall openings.
- D. Secure rigidly in place.
- E. Place extinguishers in cabinets.

END OF SECTION

CHASE
SECTION 105300 – SUPER LUMIDECK CANOPY

PART 1 - GENERAL

- 1.1 Description of Work
 - A. Work in this section includes furnishing and installation of extruded aluminum overhead hanger rod style canopies as manufactured by Mapes Industries Inc.
 - B. Related Items and Considerations
 - 1. Flashing of various designs may be required. Supplied by the installer.
 - 2. Determine wall construction, make-up and thickness.
 - 3. Ensure adequate wall condition to carry canopy loads where required.
 - 4. Consider water drainage away from canopy where necessary.
 - 5. Any necessary removal or relocation of existing structures, obstructions or materials.
- 1.2 Quality Assurance
 - A. Products meeting these specifications established standard of quality required as manufactured by Mapes Industries, Inc. Lincoln, Nebraska 1-888-273-1132.
- 1.3 Field Measurement
 - A. Confirm dimensions prior to preparation of shop drawings when possible.
 - B. If requested, supply manufacturer's standard literature and specifications for canopies.
 - C. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.
- 1.4 Performance Requirements
 - A. Canopy must conform to local building codes.
 - B. Determine if specific load requirements have been established for canopies and if stamped calculations are required for location in which canopy is installed.
- 1.5 Deliver, Storage, Handling
 - A. Deliver and store all canopy components in protected areas.

PART 2 - PRODUCTS

- 2.1 Manufacturer
 - A. Mapes Canopies
Lincoln, Nebraska
Phone: 1-888-273-1132. Fax: 1-877-455-6572.
- 2.2 Materials
 - A. Decking to be 3" extruded flat soffit .078 decking.
 - B. Fascia shall be standard 8" extruded "J" style (minimum 0125 aluminum)
 - C. Hanger rods and attachment hardware shall be powder coated to match canopy.
 - D. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and thickness shown in current Mapes brochures.

CHASE
SECTION 093100 – THIN-SET TILING

- 2.3 Finishes
 - A. Standard factory options are clear anodized, bronze baked enamel or white baked enamel.
 - B. Optional finishes include standard two-coat Kynar® colors.
- 2.4 Fabrication
 - A. All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
 - B. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.
 - C. Concealed drainage. Water shall drain from covered surfaces into integral fascia gutter and directed to either the front for front drainage or to the rear for ground level discharge via one or more designated downspouts.

PART 3 - EXECUTION

- 3.1 Inspection
 - A. Confirm that surrounding area is ready for the canopy installation.
 - B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by Mapes Industries.
 - C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed
- 3.2 Installation
 - A. Installation shall be in strict accordance with manufacturer's shop drawings. Particular attention should be given to protecting the finish during handling and erection.
- 3.3 After installation, entire system shall be left in a clean condition.

END OF SECTION

CHASE
SECTION 105623 - WIRE STORAGE SHELVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall mounted wire closet shelving.
- B. Accessories.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: Blocking in walls for attachment of shelving.
- B. 092200 – Light Gauge Metal Support Framing: Blocking in metal stud walls for attachment of standards.

1.3 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Shop Drawings: Provide drawings prepared specifically for this project; show dimensions of shelving and attachment to substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Wire Storage Shelving: ClosetMaid Corporation (800-874-0008; www.closetmaid.com).

2.2 SHELVING APPLICATIONS

- A. Shelf Depth: 16 inches, unless otherwise indicated.
- B. File Room and Janitor Room: Wall-to-wall storage shelves, close-mesh cross wire spacing, stacked at 15 inch vertically, not less than 16 inches deep. See plan and elevations for lengths of shelving.
- C. ATM Room: Wall storage shelves, close-mesh cross wire spacing, stacked at 12 inch vertically, not less than 16 inches deep.

2.3 MATERIALS

- A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with all components and connections required to produce a rigid structure that is free of buckling and warping.
 - 1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
 - 2. Coating: White Epoxy, applied after fabrication, covering all surfaces.
 - 3. Epoxy Coating: Non-toxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils thick.
 - 4. Close-Mesh Shelves: Cross deck wires spaced at 1/2 inch.
- B. Wall-Mounted Standards: Vertically slotted channel standards with double-tab cantilever brackets to suit shelving; factory finished to match shelving. See elevations for model number.
- C. Mounting Hardware: Provide manufacturer's standard mounting hardware; include hang track, wall standards, end clips and other accessories as required for complete and secure installation; factory finished to match shelving.
- D. Fasteners: As recommended by manufacturer for mounting substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect areas to receive shelving, to verify that spaces are properly prepared to receive shelf units and are of dimensions indicated on shop drawings.
- B. Verify appropriate fastening hardware.

CHASE
SECTION 105623 - WIRE STORAGE SHELVING

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

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions, with shelf surfaces level.
- B. Cap exposed ends of cut wires.

END OF SECTION

SECTION 107113 EXTERIOR SUN CONTROL DEVICES

PART 1 - GENERAL

1.1 Related Documents

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

1.2 Summary

- A. Section includes: Kawneer Aluminum Sunshade Systems, including accessories, mountings, and shims. Sunshades are anchored directly to the vertical curtain wall or storefront mullions.
1. Compatible Systems:
 - a. 1600 Wall System™1 Curtain Wall
 - b. 1600 Wall System™2 Curtain Wall
 - c. 1600UT System™1 Curtain Wall
 - d. 1600UT System™2 Curtain Wall
 - e. 1600 Wall System™5 Curtain Wall
 - f. 1600 SS Curtain Wall System
 - g. 1600 SS (SSG) Curtain Wall System
 - h. 1630 SS IR Curtain Wall System
 - i. Trifab™ VersaGlaze™ 451/451T/451UT (Center Glaze) Framing System
 - j. Trifab™ 601/601T/601UT Framing System
 - B. Related Sections:
 1. 072700 "Air Barriers"
 2. 079200 "Joint Sealants"
 3. 083213 "Sliding Aluminum-Framed Glass Doors"
 4. 084113 "Aluminum-Framed Entrances and Storefronts"
 5. 084313 "Aluminum-Framed Storefronts"
 6. 084329 "Sliding Storefronts"
 7. 084413 "Glazed Aluminum Curtain Walls"
 8. 084433 "Sloped Glazing Assemblies"
 9. 085113 "Aluminum Windows"
 10. 086300 "Metal-Framed Skylights"
 11. 088000 "Glazing"
 12. 122600 "Interior Daylighting Devices"

1.3 Definitions

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 Performance Requirements

- A. Delegated Design: Design sunshade, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated in Construction Documents.
- B. Structural Performance:
1. Combined load on sunshade configurations to be determined in accordance with ASCE 7 or applicable code requirements. Combined load consists of wind, snow and ice loads.
 2. Design sunshade configurations to withstand stresses due to combined load. Stresses resulting from thermal expansion/contraction, shall not cause permanent deformation of sunshade assemblies or disengagement from the glazed system.
 3. The assembled sunshade shall be capable of supporting the specified combined load without damage, permanent deformation, or disengagement from the glazed system mullion.

4. Blade deflection shall not exceed $L/120$ of span length. Submit test reports verifying compliance with each test requirement required by the project.
- C. Shading Performance:
 1. Design of standard configurations will allow for negligible direct sunlight to show through the blades based on project location, latitude, altitude, building orientation, surrounding conditions, and aesthetic requirements, except for round, diamond and square louver styles.
- D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
 1. Temperature Change (Range): 120 deg F (49 deg C), ambient; 180 deg F (82 deg C), material surfaces.
- E. Material Ingredient Reporting: Shall have a complete list of chemical ingredients to at least 100ppm (0.01%) that covers 100% of the product, acceptable documentation includes:
 1. Manufacturer's inventory with Chemical Abstract Service Registration Number (CASRN or CAS#).
 - a. Kawneer's Material Transparency Summary (MTS).
 2. Cradle to Cradle certification: Either document below is acceptable for this option.
 - a. Cradle to Cradle Certified™ with Material Health section Silver or above.
 - b. Silver level or above Material Health Certificate.
 3. Red List Free DECLARE label.
- F. Environmental Product Declarations (EPD): Shall have a Type III Product-Specific EPD.

1.5 Submittals

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum exterior sunshades. Include plans, elevations, sections, blade angles, blade spacing and attachments to compatible systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.6 Quality Assurance

- A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating exterior sunshades, and glazed aluminum curtain walls and storefront systems that meet or exceed performance requirements.
- C. Source Limitations: Obtain aluminum exterior sunshades and glazed aluminum curtain walls and storefront system through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups for type(s) of sunshade elevation(s) indicated, in location(s) shown on Drawings.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.7 Project Conditions

- A. Field Measurements: Verify actual locations of structural supports for sunshades by field measurements before fabrication and indicate measurements on Shop Drawings.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

Kawneer reserves the right to change configuration without prior notice when deemed necessary for product improvement.
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1.8 Warranty

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

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PART 2 - PRODUCTS**2.1 Manufacturers**

- A. Basis-of-Design Product:
 - 1. Versoleil™ Sunshade Outrigger System by Kawneer Company Inc.
- B. No substitutions allowed.

2.2 Materials

- A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall and storefront system manufacturer for strength, corrosion resistance, and application of required finish, and complying with ASTM B 221: 6063-T6, 6105-T5, or 6061-T6 alloy and temper. Wall thickness at any location for the main frame to be not less than 0.070" (1.78 mm).
- B. Thermal Barrier: When applied on a thermally broken captured system, sunshade shall be thermally isolated from the interior aluminum mullions by a nominal 0.25" (6.3 mm) thick low conductance material.
- C. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.
- D. Sealant: For sealants required within fabricated sunshade system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- E. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall and storefront members members are nominal and in compliance with AA Aluminum Standards and Data.
- F. Red List Free: All parts and materials comply with the Living Building Challenge/DECLARE Red List and the Cradle-to-Cradle (C2C) Banned List.
 - 1. PVC free
 - 2. Neoprene free

OR
- G. Red List Free: Product does not contain PVC or Neoprene.

2.3 Sunshades

- A. Sunshade Members: Manufacturer's standard extruded or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Fasteners and accessories: Nonmagnetic stainless steel to be non-corrosive and compatible with aluminum members, anchors, and other components.
- C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- D. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle sunshade materials and components to avoid damage. Protect sunshade materials against damage from elements, construction activities, and other hazards before, during and after installation.

2.4 Accessory Materials

- A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.

2.5 Fabrication

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

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4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Sunshade: Fabricate components for assembly following approved shop drawings and/or manufacturer's standard installation instructions.
- D. After fabrication, clearly mark components to identify their locations in Project according to approved shop drawings.

2.6 Aluminum Finishes

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
 1. To match storefront.

PART 3 - EXECUTION

3.1 Examination

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

3.2 Installation

- A. General:
 1. Comply with manufacturer's written instructions. Refer to installation instructions of the compatible curtain wall or storefront system.
 2. Please note that the installation instructions can differ from one compatible system to another one.
 3. Do not install damaged components.
 4. Fit joints to produce hairline joints free of burrs and distortion.
 5. Rigidly secure non-movement joints.
 6. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of
 7. moving joints.
 8. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 9. Seal joints watertight where shown on approved shop drawings and/or manufacturer's standard installation instructions.
- B. Metal Protection:
 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components plumb and true in alignment with established lines and grades.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. Install glazing as specified in Division 08 Section "Glazing".

3.3 Adlusting, Cleaning and Protection

- A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum sunshade system from damage from grinding and polishing compounds, plaster, lime, cement, acid and/or acid wash, or other harmful contaminants.

- B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 107113

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Kawneer does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility therefor.

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CHASE
SECTION 113113 - APPLIANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Lounge appliances as indicated in the Appliance Schedule and plans in the drawings.

1.2 RELATED SECTIONS

- A. 061000 – Rough Carpentry: concealed wood blocking, supports, etc.
- B. 064116 – Plastic-Laminate Clad Architectural Cabinets.
- C. 223000 – Plumbing.
- D. 260013 – Electrical General Provisions.

1.3 REFERENCES

- A. UL Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; latest edition.

1.4 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Warranties: Submit manufacturer warranty documents and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Equipment manuals: for each type of appliance.

1.5 QUALITY ASSURANCE

- A. Manufacturer qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. All appliances shall be listed and labeled by UL and compliant with NEMA standards.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver the products and materials in the manufacturers' original packaging, dry and undamaged, seals and labels intact.
- B. Store products and materials in locked room with a weather-protected environment, out of direct sunlight, clear of ground and moisture.

1.7 WARRANTY

- A. See Section 017800 – Closeout Submittals for additional warranty requirements.
- B. Minimum manufacturer warranty against material and manufacturing defects
 1. Refrigerator: 1 year.
 2. Microwave oven: 1 year.

PART 2 - PRODUCTS

2.1 LOUNGE APPLIANCES

- A. Full-size refrigerator/freezer
 1. Certifications
 - a. Energy Star® certified.
 - b. ADA compliant.
 - c. UL Listed.
 2. Total capacity: 17 cu.ft. minimum.
 3. Frost-free or auto-defrost operation.
 4. Finish: textured black.

CHASE
SECTION 113113 - APPLIANCES

5. Reversible handles- install to open as indicated in drawings.
 6. Manufacturers, models
 - a. As indicated in the Appliance Schedule in the drawings, or an alternate model by that manufacturer in lieu of specified, if discontinued. Product specifications must match or exceed those above without exceeding the planning parameters indicated in the drawings.
 - b. Substitutions: refer to Section 016000.
- B. Undercounter refrigerator:
1. Certifications
 - a. Energy Star® certified.
 - b. ADA compliant.
 - c. UL Listed.
 2. Total capacity: 4 cu.ft. minimum.
 3. Finish: textured black.
 4. Reversible or universal handles- install to open as indicated in drawings.
 5. Height: 32.5" maximum
 6. Manufacturers
 - a. As indicated in the Appliance Schedule in the drawings.
 - b. Substitutions: refer to Section 016000.
- C. Microwave
1. Certifications
 - a. ADA compliant.
 - b. UL Listed.
 2. Capacity: 2 cu.ft. minimum.
 3. Power: 1000 W minimum.
 4. Required features: turntable.
 5. Finish: black.
 6. Manufacturers
 - a. As indicated in the Appliance Schedule in the drawings.
 - b. Substitutions: refer to Section 016000.
- D. TV/DVD player
1. Certifications
 - a. Energy Star® certified.
 - b. ADA compliant.
 - c. UL Listed.
 2. Size: 19" Class
 3. Required features: 720p minimum LCD or LED HDTV with built-in DVD player and remote control.
 4. Finish: black.
 5. Manufacturers
 - a. As indicated in the Appliance Schedule in the drawings.
 - b. Substitutions: refer to Section 016000.
- E. Coffee Maker
1. Owner-provided and installed.
 2. Water connection provided by General contractor.
- F. Water purifier
1. Owner-provided and installed.
 2. Water connection provided by General contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify electrical and plumbing rough-in work is complete and correctly located. Notify the General Contractor immediately of unsatisfactory conditions.

CHASE
SECTION 113113 - APPLIANCES

3.2 INSTALLATION

- A. Install each appliance in accordance with manufacturer's instructions.
- B. Position accessibility-compliant appliances such that the required operating space and clearances to obstructions are provided.
- C. Make all final electrical and plumbing connections. Refer to Divisions 22 and 26.
 - 1. Coordinate with electrical contractor for Disposer direct-connection to adjacent disconnect switch.
 - 2. Coordinate with plumbing contractor for Disposer waste outlet connection to plumbing system.

3.3 CLEANING AND PROTECTION

- A. Remove protective packing materials and protective surface films from equipment. Dispose of all packaging, packing and protective surface covering materials in containers provided by the General Contractor.
- B. Wash and clean appliances. Clean any grease, finger marks or stains from appliances per manufacturer's recommendations.
- C. Protect installed appliances under provisions of Section 017000.

END OF SECTION

CHASE
SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manually operated window shades and accessories for sun/glare/heat control (for Lounge).
- B. Motorized window shades and accessories for sun/glare/heat control (for all other locations).

1.2 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Manufacturer's catalog data, product descriptions, installation instructions, detail sheets, and specifications for each type system specified.
- C. Samples for Selection: Manufacturer's color chart or sample set.
- D. Shop Drawings: Prepared specifically for this project; show dimensions and interface with other products.
 - 1. Room schedule including field-verified dimensions of each opening to receive window shade systems.
 - 2. Indicate System Series, operator, fabric selection, and mounting type.
 - 3. Indicate control type.
 - 4. Wiring diagrams.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original cartons.
- B. Individually package and mark shades with room number and opening number.
- C. Inspect the materials upon delivery to assure that specified products have been received.
- D. Store and handle shades to prevent damage to fabrics, finishes, and operators prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Inside Outfitters; 5725 Avery Road, Dublin, OH 43016; Contact: Dennis Hoffer Tel: (800) 742-3372, Fax: (614) 798-3511.
 - 2. Roll-a-Shade; Contact: Deanna McCoy Tel: (951) 245-5077 x116 Email: Deanna.McCoy@Rollashade.com

2.2 MANUFACTURED UNITS

- A. Manually Operated Shades: Sheer Weave 2000.
 - 1. Bead/Chain Operation: Bi-directional, wrap spring clutch made of high-strength fiberglass-reinforced polyester and high carbon steel.
 - 2. Continuous loop, certified No. 10 metal bead chain in appropriate length.
- B. Motorized Shades: Sheer Weave 2000.
 - 1. Motor Operation: Roller motor, 4-wire, instantly reversible, adjustable limit switches, thermal overload protector, and electric brake.
 - 2. Synchronized lowering level.
 - 3. Separate switch for each elevation.
 - 4. Torque Limiter with self-adjusting shut-off.
- C. Fabric for Sun/Glare/Heat Control: Sheer Weave 2000; PVC coated fiberglass and polyester weave, 5 percent open; color: White Platinum.

2.3 COMPONENTS

- A. Rollers: 2-1/2 inches diameter by 0.065 inch wall, 20 gage steel; roller assembly easily removable.

CHASE
SECTION 122413 - ROLLER WINDOW SHADES

- B. Mounting Brackets: Stamped steel, custom fabricated as required for outside jamb mounting.
- C. Roller Idler Assembly for Manual Shades: Clutch operated rollers incorporating high-strength fiberglass-reinforced polyester gudgeon, which snaps-locks into mounting bracket.
- D. Roller Idler Assembly for Motorized Shades: Spring-loaded pin for ease of installation; nylon ball, self-aligning bearing.
- E. Top Roller Box and End Caps: Four-sided, interlocking box and cover custom-extruded of 6063-T5 aluminum, 0.062 inch minimum wall; electrostatic finish.
 - 1. Size: 3 inches.
 - 2. End Caps: 16 gage steel, electrostatic finish, incorporating mounting brackets.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install window shade systems in accordance with manufacturer's instructions and these specifications.
- B. Assume responsibility for all field dimensions and mounting surfaces.
- C. Adjust window shade systems for proper operation.

END OF SECTION

CHASE
SECTION 124813 - ENTRANCE FLOOR MAT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Performance Mat.

1.2 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data: Provide data indicating properties of mat, component dimensions and edging characteristics.
- C. Shop Drawings: Indicate dimensions.
- D. Maintenance Data: Include cleaning instructions, stain removal procedures.

PROJECT CONDITIONS

- E. Verify that field measurements are as indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURER/MATERIAL

- A. Refer to Finish schedule on drawings.
 - 1. Matting Area: Sized per location to accommodate door width and vestibule depth. Minimum 6 foot left to right by 5 foot front to back.

2.2 FABRICATION

- A. Size: Fabricate entrance mats as units, but do not exceed manufacturer's size recommendation.
- B. Joints: Where joints in the entrance mats are necessary space them symmetrically and away from normal traffic ways.
- C. Entrance Mats with Curved Perimeter: Provide full size templates to the manufacturer to ensure accurate fabrication.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify size of installation location before fabricating mats.
- B. Vacuum clean floor installation location.

3.2 INSTALLATION

- A. Sizes: Shop fabricate units of floor mat to greatest extent possible in sizes as indicated. Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Where possible, verify sizes by field measurement before shop fabrication.
- B. Accessories: Where indicated for adjacent flooring or wall-to-wall applications, provide anodized aluminum transition strip as recommended by manufacturer.
- C. General: Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and to prevent tripping hazards.

3.3 CLEANING AND PROTECTION

- A. General Cleaning: Refer to Manufacturer's Cleaning and Maintenance Instructions.
- B. Owner's Personnel: Instruct Owner's personnel in proper maintenance procedures.

CHASE
SECTION 124813 - ENTRANCE FLOOR MAT

- C. Protection: Protect installed product and finish surfaces from damage during construction and until acceptance.

END OF SECTION

CHASE
SECTION 129300 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Bicycle rack.
- B. Exterior trash receptacle.
- C. Mail box.
- D. Exterior seating.
- E. Wheel stop.
- F. Custom shop- or site-fabricated exterior elements designed and detailed in the construction drawings and not otherwise addressed in the Project Manual.

1.2 RELATED SECTIONS

- A. 033000 – Cast In Place Concrete.
- B. 055000 – Metal Fabrications.
- C. 099100 – Paints
- D. 099300 – Stains and Transparent Finishes
- E. 321313 – Portland Cement Concrete Paving

1.3 SUBMITTALS

- A. See Section 013000 for submittal procedures.
- B. Product Data:
 - 1. Manufacturer's data sheets on each manufactured product to be used, including installation methods and attachment requirements.
 - 2. For each type of product indicated include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
 - 3. For each type of preserved wood in each type of product, include wood product treatment certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
- C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available materials, colors, and patterns.
- D. Shop Drawings: for custom-designed, shop-fabricated, or field-fabricated elements detailed in the drawings. For each type of product indicated include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
- E. Maintenance Data: For Project site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source limitations: Obtain each type of project site furnishing through one source from a single manufacturer.

PART 2 - PRODUCTS

- A. MATERIALS
- B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:
 - 1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 - 2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).

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3. 3. Structural Pipe and Tube: ASTM B 429/B 429M.
 4. 4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 5. 5. Castings: ASTM B 26/B 26M.
- C. Steel and Iron: Free of surface blemishes and complying with the following:
1. Plates, shapes, and bars: ASTM A 36/A 36M.
 2. Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance welded pipe complying with ASTM A 135/A 135M.
 3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
 4. Mechanical tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
 5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
 6. Perforated metal: From steel sheet not less than 0.090-inch (2.3-mm) nominal thickness; manufacturer's standard perforation pattern.
 7. Expanded metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
 8. Malleable-iron castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
 9. Gray-iron castings: ASTM A 48/A 48M, Class 200.
- D. Stainless Steel: Free of surface blemishes and complying with the following:
1. Sheet, strip, plate, and flat bars: ASTM A 666.
 2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
 3. Tubing: ASTM A 554.
- E. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.
1. Finish: Manufacturer's standard transparent wood preservative treatment and sealer.
 2. Preservative treatment: Pressure-treat wood according to AWPA U1 and the following:
 - a. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - b. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.
- F. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
1. Polyethylene: Fabricated from virgin plastic HDPE resin.
 2. Recycled Polyethylene: Fabricated from not less than 90 percent recycled postconsumer waste by weight content HDPE.
- G. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or non-corrodible materials; commercial quality, tamperproof, vandal and theft resistant.
1. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit.
- H. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications. Refer to Section 055000, 2.1, F. Miscellaneous Materials.
- I. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- J. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film.

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Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.

2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 BICYCLE RACK

- A. Game Time, Inc., www.gametime.com: #F7700.
- B. Bicycle Racks: Tubular steel pipe formed to allow at least one bicycle to lock simultaneously on each bend and each end, securing one wheel and part of the frame.
 1. Style: Serpentine rack formed from a continuous "S."
 2. Pipe: Carbon steel, ASTM A 53/A 53M; NPS 2, Schedule 40 (2-3/8 inch O.D., 0.154 inch wall).
 3. Capacity: 5 bicycles.
 4. Mounting: In-ground anchor.
 5. Finish: Powder coat, maintenance-free and weather-resistant.
 6. Color: Brown.
 7. Accessories: In-ground grout cover.

2.3 MAIL BOX

- A. Salsbury Industries, www.mailboxes.com
 1. Box #4350S
 2. Pedestal #4385S

2.4 TRASH CAN

- A. Rubbermaid, www.rubbermaidcommercial.com: #A17 Architek Radius Top, Architectural bronze.

2.5 WHEEL STOP

- A. Rubberform, www.rubberform.com: #RF-PWS38.

2.6 EXTERIOR SEATING

- A. As specified or detailed in the construction drawings.

2.7 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles.
- B. Separate metals from dissimilar materials to prevent electrolytic action.
- C. Welded Connections: Weld connections continuously. Weld solid members with full-length, full penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- E. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
- F. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- G. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.8 FINISHES, GENERAL

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

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2.9 ALUMINUM FINISHES

- A. Baked-Enamel and Powder-Coat Finishes: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence. Inspect for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Require correction of conditions detrimental to the proper and timely completion of the work.
- C. Do not begin installation until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 INSTALLATION

- A. Coordinate with work of Section 321313.
- B. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- C. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- D. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.
- E. Post setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- F. Posts set into voids in concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, non-metallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.
- G. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, non-metallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION

CHASE
SECTION 220013 - PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, material and equipment called for in these Specifications and accompanying Drawings and shall install the system complete in every respect. All purchases equipment to comply with local system complete in every respect.

1.3 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. The following general rules and requirements apply to the interpretation of all phases of the drawings and specifications.
- B. Drawings for the work consist of a complete set of plans and specifications, to which will be added during the period of construction any other detail drawings as may be necessary in the opinion of the Architect to show the proper installation of the work.
- C. The dimension and ratings of equipment herein specified or indicated on the drawings are intended to establish the outlined characteristic of such equipment generally.
- D. Where manufacturer's catalog numbers or types are mentioned in the specifications or indicated on the drawings, they are intended to be used. In all cases the manufacturer shall verify the duty specified with the particular characteristics of the equipment they intend to supply. The manufacturer of equipment is cautioned to consult other applicable articles in the specification, particularly those in motors, starters, etc.
- E. The drawings and accompanying specifications are to be considered as an important and integral part of same, and anything omitted from one and embodied in the other is to be considered as essential to the requirements of the Contract and must be furnished and installed by the Contractor.
- F. Equipment that does not fit into available building spaces will not be approved regardless of whether the make is approved.
- G. No important dimensions shall be obtained by scaling a drawing; important dimensions and elevations shall be determined by computing from the established dimensions and reference points given on the Architect's drawings. Site grade elevations shall be determined from the Architect's site drawings. However, it is not the intention of the drawings to indicate all necessary offsets in piping and ductwork in such a manner as to conform to structure, avoid obstructions, preserve head room and keep all openings and passageways clear without further construction.
- H. It is intended that apparatus shall be located symmetrically with Architectural elements, notwithstanding the fact that locations indicated by the drawings may be distorted for clearness in presentation.
- I. Where discrepancies are found by the Contractor after signing the Contract between the Specification, Sections, or between drawings, or any contradictory sizes or plate numbers describing the manufacturer's item, such shall be brought to the attention of the Architect and the Architect shall determine the proper items to be used with no additional cost to the Owner.

1.4 COOPERATION AND COORDINATION

- A. Contractor shall confer with other trades at the site before installation of his work to avoid interferences so that maximum headroom and clearances may be maintained. In the event that interferences develop between work and various trades, the Owners decision will be final and no additional compensation will be allowed for the moving of misplaced work.
- B. Particular attentions shall be paid to situations where recessed equipment, pipes and lights occur, or where the work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.

CHASE

SECTION 220013 - PLUMBING GENERAL PROVISIONS

- C. It is presumed that the Contractor has carefully examined the drawings and specifications for the entire work and the job conditions that will ensue before executing the agreement and has reported to the Architect in writing any interference of conflicts with his work. If the Contractor has failed to call such interferences of conflicts relative to this work, the drawings, specifications, the work of other trades, and job conflicts arise during the construction period, they shall be submitted and subjected to the Architect's decision, all changes made and all damage to construction shall be repaired by the Contractor without additional cost.
- D. All fixtures, equipment, devices, switches, outlets, pumps, etc., shall be positioned to avoid all interferences with and to assure proper coordination with the work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc. shall be coordinated with all wall, floor and ceiling patterns. The Architect will work out the conflicts and adjustments where such adjustments are warranted.

1.5 WORK PRIORITY OVER OTHER TRADES

- A. All trades shall work in cooperation with one another to fit piping and ductwork into the structure as job conditions may demand. The Architect shall make all final decisions as to right of way and run of pipe, ducts, etc.
- B. In general, priority is to be arranged as follows:
 - 1. Recessed lighting fixtures.
 - 2. Sheet metal ductwork.
 - 3. Plumbing waste lines, downspouts and vents.
- C. All reinforcing of joists and studs shall be kept at an absolute minimum, and when it is necessary shall be only as approved by the Architect and local code. Where notching is permitted it shall be narrow and as shallow as possible. The Contractor as required for his work shall do all notching unless otherwise noted on the drawings.
- D. All equipment, devices, ducts, fixtures, hangers, etc. shall be securely and permanently hung from supporting walls, ceilings, etc. as approved.

1.6 CUTTING AND PATCHING

- A. Each Contractor shall do all cutting and patching of building materials required for the installation of work in his contract. No structural members shall be cut without the approval of the Architect and all cutting shall be done in a manner as directed by him.

1.7 DEFECTIVE WORK AND MATERIAL

- A. All material or work found to be defective or not in strict conformity with the drawings or different from the requirements of the drawings and specifications or defaced or injured through negligence of the Contractor or his employees, or through the action of fire or weather will be rejected and shall be immediately removed from the premises by the Contractor and satisfactory material and work substituted therefore without delay.
- B. Any defective work or imperfect work that may be discovered shall be corrected immediately on notice. No previous inspection or certificate on account shall behold to relieve the Contractor from his obligation to furnish sound material and to perform good and satisfactory work.

1.8 CHASES AND OPENINGS

- A. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located and shall do any cutting and patching caused by the neglect to do so.

1.9 INSERTS AND SLEEVES

- A. Layout the work in accordance with approved shop drawings. Furnish and set in place in advance of pouring of slabs or construction of walls, all inserts, and sleeves necessary to complete the work. The use of lead shield anchors or power-actuated fasteners and devices is not permitted.

1.10 EXCAVATING AND BACKFILLING

- A. Contractor shall provide all excavating, backfilling and removal of unused excavated material not used for trenches required to install his underground work inside the building.
- B. Trenching: Excavate to the require depths and grade bottoms of trenches to secure required slit for pipelines or ductwork. Where mud or otherwise unstable soil is encountered in the bottom of the trenches which is incapable of supporting the pipe such soil shall be removed to firm bearing and the trenches backfilled with sand and the proper grade and tamped to provide uniform firm support. Pipe and ducts shall not be laid on frozen sub-grade.
- C. Sides of trenches at a point 1" above top of pope shall not be more than the O.D. of the pipe or duct, expressed in inches, plus 12". Above this point the sides of trenches shall be kept as nearly vertical as possible and braced and shorted to protect foundations, utility pipe lines and workmen.
- D. The bottom of the trench shall be accurately excavated by hand to provide firm, uniform bearing for the bottom quarter of the pipe or duct. Pipe having bells, sleeves or other enlargement at the joints shall have recesses excavated to accommodate these joints.
- E. Backfilling: Trenches shall not be backfilled until piping has been tested by the Contractor as required and approved by the Owner and/or any local authorities having jurisdiction.
- F. All trenches inside the building shall be backfilled to the top which clean sand and compacted by hand tamping.
- G. Backfill for the remainder of the trench shall be of selected excavated material placed in layers which, when compacted, will not exceed 1'-0". All backfilling shall be well rammed in place at the sides and puddled every foot in height.

1.11 CLEANING UP

- A. See General Conditions, which form a part of this section.
- B. Contractor during the process of the work shall keep the premises reasonably free of all debris and waste materials resulting from the work under this section. All such debris and rubbish shall be removed from the site. On completion and before final acceptance of the work, all debris, rubbish, leftover materials, tools, and equipment shall be removed from the site.
- C. Machinery, apparatus, exposed piping and insulation shall be thoroughly cleaned of cement, plaster and other materials, grease and oil spots removed with cleaning solvent, surfaces carefully wiped, cracks and corners scraped clean.
- D. Failure of the Contractor to clean up as required will be cause for the Architect to order this work done by others at the expense of this Contractor.

1.12 PROTECTION

- A. Each trade shall keep all of its respective pipe and duct openings closed by means of plugs or caps to prevent the entrance of foreign matter, and cover the fixtures, equipment and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation. Any such fixtures, equipment or apparatus damaged prior to final acceptance of the work shall be restored to its original condition or replaced by the respective mechanical trade at no cost to the Owner.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Contractor shall arrange for all technical instructions of Owners maintenance personnel, either by this own or the equipment manufacturer's personnel. A letter shall be written to the Engineer prior to these instruction days so that he can attend.
- B. Manuals: Furnish three (3) sets of manuals, in bound form, hard cover, each containing data covering capacities, maintenance and operation of each major item of equipment and apparatus. Operation instructions shall cover all phases of control and shall also include the following:
 - 1. List of Spare Parts: Recommend for normal service requirements.
 - 2. Part List: Identifying the various parts of the equipment for repair and replacement purposes.

- C. Instruction books may be standard booklets but should be clearly marked to indicate applicable equipment and paragraphs.

1.14 APPROVALS

- A. Prior to the commencement of work or the installation of any equipment this contractor must obtain approval from the Architect/Engineer. Requests for approvals shall be made through the Architect. No less than six (6) copies are required. No portion of the work requiring approval shall be commenced until said portion has been returned bearing the Architect/Engineer's approval or a letter stating it has been accepted and approved.

1.15 SHOP DRAWINGS

- A. See General Conditions that form a part of this section.
- B. All shop drawings shall have the following information:
 - 1. Date Submitted.
 - 2. Name and location of the project.
 - 3. Name of the Architect and Consulting Engineer.
 - 4. Name of the equipment manufacturer and supplier.
 - 5. Specification reference - Division, Section and Paragraph.
 - 6. System and area being served by the item being submitted.
 - 7. Plan location (either room name and number or column line cross reference) of the item being submitted.
 - 8. Capacity of item being submitted
 - 9. Outline dimensions.
 - 10. Operating clearances.
 - 11. Engineering data to include substantial compliance with the specifications.
- C. Where equipment data forms a part of a larger catalog containing other unrelated apparatus, the pertinent pages shall be removed and submitted separately with marking to indicate the specific item offered for approval.
- D. Each manufacturer's shop drawings submitted shall also have a typewritten short description of general maintenance required weekly, monthly, quarterly, semi-annually, and annually (NOT STANDARD MAINTENANCE MANUALS). The following information shall also be shown: equipment model, serial number, phone number of service company, sizes, type, and numbers of motors, coils, filters, pumps, belts, bearings, type of lubrication used, etc.
- E. Also submit piping and duct layout shop drawings showing clearances, etc.

1.16 RECORD DRAWINGS

- A. Contractor shall keep on the job one complete set of the contract working drawings on which he shall record any deviations or changes from such drawings made during construction. Record drawings shall show change in size, type, capacity, etc. of materials, device or piece of equipment, location of any outlet or source in building service system, re-routing of any piping or other building services.
- B. These drawings shall also record the location of all concealed services, piping and other equipment by indication of measured dimensions to each such line from readily identifiable and accessible walls or columns of the building. Drawings shall show elevations of duct runs etc.
- C. When the project is completed and as a condition of final payment, the Contractor shall certify to the accuracy of the record drawings and specifications by endorsement thereof and shall require each Subcontractor to so certify by endorsement of the record drawings and specifications for his portion of the work, and deliver same to the Owner, together with copies of all change orders and shop drawings, in accordance with the General and Supplementary General Conditions.

1.17 GUARANTEE

- A. Each Contractor shall and hereby does guarantee and warranty all work and material performed and installed by him directly or by any of his subcontractors against defective and inferior materials and workmanship for a period of one (1) year from the date of acceptance. All guarantees shall be in writing and delivered to the Owner before final certificates are issued. Contractor shall make good at his own expense and without cost of the Owner any and all defective and inferior materials and workmanship that develop within the guarantee period.

1.18 PAINTING

- A. All priming and painting shall conform to all requirements of the painting specifications and the Architect shall select all types and colors.
- B. Piping, conduit, etc. which are in walls, floors, or above a finished ceiling shall not be painted.
- C. Exposed ductwork.

1.19 BELT AND COUPLING GUARDS

- A. Guards shall be provided for all belt-driven units and at chairs, gears, couplings, keys projecting set screws, and other rotating or moving parts. Belt guards shall be made to enclose both pulleys and belts on exposed sides, and shall be constructed of galvanized steel top and bottom with expanded metal front pitted and locked into rim. The entire assembly shall be rigidly supported with all necessary supplementary steel, and shall be provided for greasing, oiling, adjusting, checking of equipment, etc. Provide coupling guards on direct connected units. Guards shall be designed for easy removal for service and shall comply with Underwriters' Safety Requirements, and OSHA Requirements.

1.20 FLOOR AND CEILING PLATES

- A. On all exposed pipes passing through floors, walls, partitions, plaster furring, etc., provide 1" split-type steel plates around them. In unfinished rooms, plates shall be prime coated, in furnished rooms, plates shall be chrome plated.

1.21 MINOR DEVIATIONS

- A. The dimensions and ratings of equipment herein specified or indicated on the drawings are intended to establish the desired outlines and characteristics of such equipment. Minor deviations will be permitted to allow manufacturers specified to bid their nearest stock equipment.
- B. Manufacturers catalog or model numbers and types mentioned in the specifications or indicated on the drawings are intended to be used as guides and shall not be interpreted as taking precedence over specific ratings or duty called for or shown, which modify stipulations in such catalogs. In all cases, the manufacturer shall verify the duty specified with the particular characteristics of the equipment he intends to offer for approval, and shall offer only items that comply with specification requirements.
- C. Where the equipment furnished differs in physical character from that specified or indicated, or where Contractor's substituted equipment requires increased services and/or facilities to be provided by other trades, and such substitutions is acceptable to the Owner. The Contractors making the substitutions shall pay for such services and facilities and shall bear all costs for modifying the building to receive the product.

END OF SECTION

CHASE
SECTION 220700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Perform all work necessary to complete the insulation of the mechanical systems, as shown on the Drawings and specified herein. The work shall include insulation for but not be limited to the following principal items.
 - 1. Piping.
 - 2. Equipment.
- B. Related Work Specified Elsewhere: 221000 - Plumbing Piping.

1.2 JOB CONDITIONS

- A. Contractor shall refer to the Architectural plans for details and to the Mechanical Drawings for locations of ductwork, piping and equipment furnished under other sections of these Specifications.
- B. Each Contractor shall do all cutting and patching of building material required for installation work in his contract. No structural members shall be cut without the approval of the Architect and all cutting shall be done in a manner as directed by him.

1.3 GUARANTEE

- A. Insulation Contractor shall guarantee and shall require guarantee from all manufactures furnishing materials, that materials and installation comply with all the requirements of the drawings and specifications.

1.4 PROTECTION

- A. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Any such insulation or covering prior to final acceptance of the work shall be satisfactorily repaired or replace at no additional cost to the Owner.

1.5 SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
- B. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
- C. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Provide insulation materials of manufacture and type as listed below, or approval equal.
 - 1. Glass Fiber Insulation: Inorganic glass fibers, bonded with a thermosetting resin.
 - a. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
 - b. Board: ASTM C 612, Class 2, semi-rigid jacketed board.
 - 1) Thermal Conductivity: 0.26 average maximum, at 75 deg F mean temperature.
 - 2) Density: 12 pcf average maximum.
 - c. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
 - 1) Thermal Conductivity: 0.32 average maximum, at 75 deg F mean temperature.
 - d. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
 - 1) Thermal Conductivity: 0.26 average maximum at 75 deg F mean temperature.
 - 2) Density: 10 average maximum.
 - e. Adhesive: Produced under the UL Classification and Follow-up service.

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- 1) Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
 - a) Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
 - b) Class 2, Grade A for bonding glass fiber insulation to metal surfaces.
 - 2) Service Temperature Range: Minus 20 to 180 deg F.
- f. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.
2. Flexible Elastomeric Cellular Insulation: Flexible expanded closed-cell structure with smooth skin on both sides.
 - a. Tubular Materials: ASTM C 534, Type I.
 - b. Sheet Materials: ASTM C 534, Type II.
 - c. Thermal Conductivity: 0.30 average maximum at 75 deg F.
 - d. Coating: Water based latex enamel coating recommended by insulation manufacturer.
 - e. Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
3. Jackets: ASTM C 921, Type 1, except as otherwise indicated.
 - a. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
 - 1) Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
 - 2) Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.
 - b. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.
 - 1) Adhesive: As recommended by insulation manufacturer.
 - c. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.
 - 1) Adhesive: As recommended by insulation manufacturer.
4. Accessories and Attachments: Provide the following accessories:
 - a. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd.
 - 1) Tape Width: 4 inches.
 - 2) Cloth Standard: MIL-C-20079H, Type I.
 - 3) Tape Standard: MIL-C-20079H, Type II.
 - b. Bands: 3/4-inch wide, in one of the following materials compatible with jacket:
 - 1) Stainless Steel: Type 304, 0.020 inch thick.
 - 2) Galvanized Steel: 0.005 inch thick.
 - 3) Aluminum: 0.007 inch thick.
 - c. Wire: 14-gage nickel copper alloy, 16-gage, soft-annealed stainless steel, or 16-gage, soft-annealed galvanized steel.
 - d. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch kraft paper.
 - e. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.
5. Vapor Barrier Compound: Water-based, fire-resistive composition.
 - a. Water Vapor Permeance: 0.08 perm maximum.
 - b. Temperature Range: Minus 20 to 180 deg F.
6. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
 - a. Water Vapor Permeance: 0.02 perm maximum.
 - b. Temperature Range: Minus 50 to 250 deg F.
 - c. Color: Aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION STANDARDS

- A. Workmanship: Insulation shall be installed in first-class, neat, workmanlike fashion. Stapling of vapor-barrier jackets will not be allowed. Vapor-barrier and canvas shall run continuously through hangers

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and vapor-barrier shall not be pierced for any reason. ASME stamps, UL labels and similar stamps and labels shall not be covered. Unsatisfactory installations will be rejected and shall be removed and replaced.

- B. Pipe covering: Insulate piping as specified below. At hanger points of piping insulation with glass fiber, provide wood blocks as specified.
- C. Installation, General: Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
1. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
 2. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.
 3. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
 4. Install insulation with smooth, straight, and even surfaces.
 5. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
 6. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
 7. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
 8. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
 9. Keep insulation materials dry during application and finishing.
 10. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
 - a. Nameplates and data plates.
 - b. Access panels and doors in air distribution systems.
 - c. Fire protection piping systems.
 - d. Sanitary drainage and vent piping.
 - e. Drainage piping located in crawl spaces, unless indicated otherwise.
 - f. Below grade piping.
 - g. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
 - h. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.
- D. Pipe Insulation Installation, General: Unless otherwise indicated, install pipe insulation as follows:
1. Tightly butt longitudinal seams and end joints. Bond with adhesive.
 2. Stagger joints on double layers of insulation.
 3. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.
 4. Apply insulation with a minimum number of joints.
 5. Apply insulation with integral jackets as follows:
 - a. Pull jacket tight and smooth.
 - b. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
 - c. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
 - 1) Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.
 - d. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
 - e. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
 - f. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
 6. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to

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- interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.
7. Exterior Wall Penetrations: For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor barrier coating.
 8. Exterior Wall Penetrations: For penetrations of below grade exterior walls, extend metal jacket for exterior insulation through penetration to a point 2 inches from interior surface of wall inside the building. Seal ends of metal jacket with vapor barrier coating. Secure metal jacket ends with metal band. At point where insulation metal jacket contacts mechanical sleeve seal, insert cellular glass preformed pipe insulation to allow sleeve seal tightening against metal jacket. Tighten and seal sleeve to jacket to form a watertight seal.
 9. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer. Refer to Division 7 Section "Joint Sealants."
 10. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer. Refer to Division 7 for firestopping and fire-resistant joint sealers.
 11. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.
 12. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
 - a. Use same material and thickness as adjacent pipe insulation.
 - b. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
 - c. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
 - d. Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.
 - e. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.
 - f. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
 - g. Cover insulation, except for metal jacketed insulation, with 2 layers of lagging adhesive to a minimum thickness of 1/16 inch. Install glass cloth between layers. Overlap adjacent insulation by 2 inches in both directions from joint with glass cloth and lagging adhesive.
 13. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 15 Section "Supports and Anchors." For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends.
 - a. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.
- E. Glass Fiber Pipe Insulation Installation: Bond insulation to pipe with lagging adhesive. Seal exposed ends with lagging adhesive. Seal seams and joints with vapor barrier compound.
- F. Flexible Elastomeric Cellular Pipe Insulation Installation: Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
1. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
 - a. Miter cut materials to cover soldered elbows and tees.
 - b. Fabricate sleeve-fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.
- G. Equipment Insulation Installation, General: Unless otherwise indicated install equipment insulation as follows:
1. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.

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2. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.
 3. Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.
 4. Bevel insulation edges for cylindrical surfaces for tight joint.
 5. Secure sections of insulation in place with wire or bands spaced at 9-inch centers, except for flexible elastomeric cellular insulation.
 6. Protect exposed corners with corner angles under wires and bands.
 7. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
 8. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.
 9. Pumps: Where insulation is indicated, fabricate galvanized steel boxes lined with insulation. Fit boxes around pumps and coincide joints in box with the splits in the pump casings. Fabricate joints with outward bolted flanges.
 10. Finishing: Except for flexible elastomeric cellular insulation, apply 2 coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.
- H. Glass Fiber Equipment Insulation Installation: Secure insulation with anchor pins and speed washers. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints. Apply a smoothing coat of insulating and finishing cement to finished insulation.
- I. Flexible Elastomeric Cellular Equipment Insulation Installation: Install sheets of the largest manageable size. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.
- J. Jackets: Unless otherwise indicated, install jackets as follows:
1. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2-inch laps at longitudinal joints and 3-inch-wide butt strips at end joints.
 - a. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
 2. Interior Exposed Insulation: Install continuous PVC jackets.
 3. Interior Exposed Insulation: Install continuous glass cloth jackets.
 4. Exterior Exposed Insulation: Install continuous PVC jackets and seal all joints and seams with waterproof sealant.
 5. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.
 6. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2-inch overlap at joints. Embed glass cloth between (2) 1/16-inch-thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.
- K. Finishes: Paint finished insulation as specified in Division 9 Section "Painting."
- L. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.
- M. Applications: Materials and thicknesses are specified in schedules at the end of this Section.
1. Interior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - a. Domestic cold water.
 - b. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
 - c. Domestic hot water.
 - d. Sanitary drains for fixtures accessible to the disabled.
 - e. Refrigerant suction.
 2. Interior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - a. Domestic cold water.

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- b. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
- c. Domestic hot water.
- d. Refrigerant suction.
- e. Chilled water (35 to 55 deg F).
- 3. Exterior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - a. Domestic cold water.
 - b. Storm water.
 - c. Refrigerant suction.
- 4. Exterior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - a. Domestic cold water.
 - b. Storm water.
 - c. Refrigerant suction.
- 5. Equipment: Unless otherwise indicated, insulate the following indoor equipment:
 - a. Domestic cold water equipment, tanks, and pumps.
 - b. Domestic hot water equipment, tanks, and water heaters.
 - c. Refrigerated drinking water equipment, tanks, pumps, and heat exchangers.
- 6. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
 - a. Interior concealed supply, return and outside air ductwork.
 - b. Interior exposed supply, return and outside air ductwork.
 - c. Exterior exposed supply and return ductwork.
 - d. Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.
- N. Pipe Insulation Schedules: Abbreviations used in the following schedules include:
 - 1. Field-Applied Jackets: P - PVC, K - Foil and Paper.
 - 2. Pipe Sizes: NPS - Nominal Pipe Size.
- O. Domestic Cold Water and Storm Water All Sizes (Interior): 1/2-inch-thick glass fiber, cellular glass, or flexible elastomeric insulation. Field-applied jacket is not required.

INTERIOR DOMESTIC HOT WATER

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
1/2 TO 1-1/4	GLASS FIBER	1/2	NO	NONE
	FLEXIBLE ELASTOMERIC	1/2	NO	NONE
1-1/2 TO 4	GLASS FIBER	1/2	NO	NONE
	FLEXIBLE ELASTOMERIC	3/4	NO	NONE

SANITARY DRAINS AND TRAPS EXPOSED AT FIXTURES FOR DISABLED

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
1 TO 1-1/2	GLASS FIBER	1	NO	NONE
	FLEXIBLE ELASTOMERIC	1/2	NO	NONE

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INTERIOR REFRIGERANT SUCTION - EXPOSED AND CONCEALED

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
1/2 TO 1-1/4	GLASS FIBER	1	YES	NONE
	FLEXIBLE ELASTOMERIC	3/4	YES	NONE

EXTERIOR REFRIGERANT SUCTION - EXPOSED AND CONCEALED

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
1/2 TO 1-1/4	GLASS FIBER	2	YES	(P)
	FLEXIBLE ELASTOMERIC	3/4	YES	NONE

P. Equipment Insulation Schedules:

INTERIOR EXPOSED DOMESTIC COLD WATER EQUIPMENT, TANKS, AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
GLASS FIBER FLEXIBLE ELASTOMERIC	BLOCK OR BOARD	1	YES	(P)(K)
	SHEET	3/4	YES	NONE

INTERIOR EXPOSED DOMESTIC HOT WATER EQUIPMENT, TANKS, AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
GLASS FIBER	BLOCK	2	NO	(K)

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
GLASS FIBER	BLOCK	2	YES	(P)

INTERIOR EXPOSED HEATING WATER EQUIP, TANKS, PUMPS, AND HEAT EXCHANGERS
(100 TO 250 DEG F)

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
GLASS FIBER	BLOCK OR BOARD	2	NO	(K)

END OF SECTION

CHASE
SECTION 221000 – PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. This Contractor shall furnish all labor, material, equipment and services required to execute, install and complete, ready for use, all work according to the drawings and specifications.
- B. Submittals: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- C. Product data for couplings and fittings for grooved-end copper tube and grooved-end copper fittings.
- D. Water samples, test results, and reports specified in "Field Quality Control" and "Cleaning" Articles.
- E. Comply with ASME B31.9 "Building Services Piping" for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

- A. The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in "Pipe and Fittings Applications" Paragraph.
 - 1. Hard Copper Tube: ASTM B88, Types L and M, water tube, drawn temper.
 - 2. Soft Copper Tube: ASTM B88, Types K and L, water tube, annealed temper.
 - 3. Copper Drainage Tube: ASTM B306, Type DWV, drawn temper.
 - 4. Steel Pipe: ASTM A 53, Type S, Grade A, Schedule 40, seamless, galvanized, plain ends.
 - a. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless, galvanized, carbon-steel pipe.
 - 5. Ductile-Iron Pipe: AWWA C151, Classes 50 and 51, mechanical joint and push-on joint, with AWWA C104 cement-mortar lining.
 - 6. Flanged Ductile-Iron Pipe: AWWA C115, ductile-iron barrel, Class 150 or 300 iron-alloy threaded flanges, with AWWA C104 cement-mortar lining.
 - 7. Hub and Spigot, Cast-Iron Soil Pipe: ASTM A74, Service Class.
 - 8. Hubless, Cast-Iron Soil Pipe: CISPI 301. (When approved by municipal codes).

2.2 PIPE AND TUBE FITTINGS

- A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.
- B. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18.
- C. Wrought-Copper and Bronze, Grooved-End Fittings: ASTM B 75 Tube and ASTM B 584 Bronze Castings.
- D. Wrought-Copper, Solder-Joint, DWV Drainage Fittings: ASME B16.29.
- E. Cast-Copper-Alloy, Solder-Joint, DWV Drainage Fittings: ASME B16.23.
- F. Wrought-Copper, Solder-Joint, Sovent Drainage Fittings: ASME B16.43.
- G. Cast-Copper-Alloy, Solder-Joint, Sovent Drainage Fittings: ASME B16.32.
- H. Copper Tube, Grooved-End Mechanical Fittings: ASTM B 75, copper tube and ASTM B 584 bronze castings.
- I. Bronze Flanges: ASME B16.24, Classes 150 and 300.
- J. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.
 - 1. Threaded Ends: Threads conforming to ASME B1.20.1.

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- K. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300, hexagonal stock, with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends having threads conforming to ASME B1.20.1.
- L. Galvanized, Cast-Iron Threaded Fittings: ASME B16.4, Classes 125 and 250, standard pattern, with threads conforming to ASME B1.20.1.
- M. Cast-Iron Threaded Flanges: ASME B16.1, Classes 125 and 300.
- N. Ductile-Iron and Gray-Iron Gasketed Fittings: AWWA C110 standard pattern or ductile-iron AWWA C153 compact pattern, 250 psig minimum pressure rating, with AWWA C104 cement-mortar lining and AWWA C111 rubber gaskets.
- O. Ductile-Iron and Gray-Iron Flanged Fittings: AWWA C110, 250-psig minimum pressure rating, with AWWA C104 cement-mortar lining.
- P. Hub and Spigot, Cast-Iron Soil Pipe Fittings: ASTM A74, Service Class.
- Q. Hubless, Cast-Iron Soil Pipe Fittings: CISPI 301.

2.3 JOINING MATERIALS

- A. Solder, brazing, and welding filler metals are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Cast-Iron Soil Pipe and Fittings: ASTM C 564 neoprene rubber gaskets and lubricant.
- C. Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: The following materials apply:
 - 1. Push-On Joints: AWWA C111 rubber gaskets and lubricant.
 - 2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
 - 3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
- D. CISPI Couplings for Hubless Cast-Iron Soil Pipe and Fittings: CISPI 310, having ASTM C 564 neoprene sealing sleeve, with 300 Series stainless-steel corrugated shield-and-clamp assembly.
- E. Stainless Steel, Heavy-Duty Couplings for Hubless Cast-Iron Soil Pipe and Fittings: ASTM C 564 neoprene sealing gasket, with Type 304 stainless-steel housing or shield and stainless-steel clamps. Coupling shall be 3 inches wide in sizes 1-1/2 to 4 inches and 4 inches wide in sizes 5 to 10 inches.
- F. Cast-Iron, Heavy-Duty Couplings for Hubless Cast-Iron Soil Pipe and Fittings: ASTM C 564 neoprene sealing gasket, with cast-iron housing and stainless steel bolts.
- G. FM-Type, Heavy-Duty Couplings for Hubless Cast-Iron Soil Pipe and Fittings: FM-approved, ASTM C 564 elastomeric sleeve, with stainless steel band and strips or cast-iron housing and corrosion-resistant bolts.
- H. Sleeve-Type Couplings for Plain-End, Nonpressure System Pipe: Rubber or elastomeric sleeve and stainless steel band assembly, fabricated to match outside diameters of pipes to be joined.
- I. Sleeves: ASTM C 564, rubber for cast-iron soil pipe and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
 - 1. Bands: Stainless steel, one at each pipe insert.
- J. Gasket-Type Couplings for Plain-End, Nonpressure System Pipe: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub and adjoining pipe outside diameter.
 - 1. Gaskets: ASTM C 564, rubber for cast-iron soil pipe and ASTM F477, elastomeric seal for plastic pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
- K. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings: ASTM A536 ductile-iron or ASTM A 47 malleable-iron housing having copper-colored enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design and suitable for hot water, with ASTM A183 carbon-steel bolts and nuts.

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2.4 VALVES

- A. Refer to Division 15 Section "Valves" for gate, globe, ball, butterfly, and check valves, and Division 15 Section "Plumbing Specialties" for special-duty valves.

PART 3 - EXECUTION

3.1 EXCAVATION, TRENCHING AND BACKFILLING

- A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING

- A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.
- B. Remove unstable, soft, and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.
- C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig bell holes at each pipe joint to relieve bells of loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPE AND FITTINGS APPLICATIONS

- A. Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.
- B. Water Distribution Piping Below Ground: Use the following:
 - 1. 4 to 12 Inches: Ductile-iron pipe, ductile-iron or gray-iron fittings, rubber gaskets, and push-on or mechanical joints.
 - 2. 2-1/2 to 4 Inches: Soft copper tube, Type L, cast-copper-alloy, solder-joint pressure fittings and soldered joints with Alloy Sn95, Sn94, or E solder.
 - 3. 2-1/2 to 3-1/2 Inches: 3- or 4-inch size, ductile-iron pipe, ductile-iron or gray-iron fittings or ductile-iron compact fittings, rubber gaskets, and push-on or mechanical joints.
 - 4. 2 Inches and Smaller: Soft copper tube, Type L, cast-copper-alloy solder-joint pressure fittings and soldered joints with Alloy Sn95, Sn94, or E solder.
- C. Water Distribution Piping Above Ground:
 - 1. 4 to 12 Inches: Steel pipe; galvanized, cast-iron threaded fittings; cast-iron threaded flanges; galvanized, flanged steel expansion joints; malleable-iron unions; and threaded or flanged joints.
 - 2. 4 Inches and Smaller: Hard copper tube, Type L; wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges; and solder joints with Alloy Sn95, Sn94, or E solder.
- D. Soil, Waste, and Vent Piping: Use the following:
 - 1. 5 to 10 Inches: Hubless cast-iron soil pipe; hubless cast-iron soil pipe fittings; cast-iron, heavy-duty couplings for hubless cast-iron soil pipe and fittings; and hubless joints.
 - 2. 2 to 4 Inches: Hubless cast-iron soil pipe; hubless cast-iron soil pipe fittings; cast-iron, heavy-duty couplings for hubless cast-iron soil pipe and fittings; and hubless joints.
 - 3. 1-1/2 Inches: Hubless cast-iron soil pipe, hubless cast-iron soil pipe fittings, cast-iron heavy-duty couplings for hubless cast-iron soil pipe and fittings, and hubless joints.
 - 4. 1-1/4 and 1-1/2 Inches: Copper drainage tube, wrought-copper or cast-copper-alloy drainage fittings, and soldered joints with Alloy E or Alloy Sn50 solder.
- E. Storm Drainage Piping:
 - 1. 5 to 10 Inches: Hubless cast-iron soil pipe, hubless cast-iron soil pipe fittings, cast-iron heavy-duty couplings for hubless cast-iron soil pipe and fittings, and hubless joints.
 - 2. 2 to 4 Inches: Hubless cast-iron soil pipe, hubless cast-iron soil pipe fittings, cast-iron heavy-duty couplings for hubless cast-iron soil pipe and fittings, and hubless joints.

3.4 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, use gate, ball, or butterfly valves for shutoff duty and globe, ball, or butterfly valves for throttling duty.

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3.5 PIPING INSTALLATION, GENERAL

- A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

3.6 SERVICE ENTRANCE PIPING

- A. Extend water distribution piping and connect to water service piping of size and in location indicated for service entrance to building. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at water service entrance.
- B. Ductile-Iron Water Service Pipe: Comply with AWWA C600. Install buried pipe inside building between shutoff valve, wall and floor penetrations, and point 5 feet outside building, with restrained joints, including anchoring pipe to wall or floor. Provide supports (thrust blocks) at vertical and horizontal offsets.
- C. Extend building storm drain piping and connect to building storm sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of building storm drain and building storm sewer.
- D. Extend building sanitary drain piping and connect to sanitary sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of building sanitary drain and building sanitary sewer.
- E. Install sleeve and mechanical sleeve seal at service penetrations through foundation wall for watertight installation.

3.7 WATER DISTRIBUTION PIPING INSTALLATION

- A. Install with 1/32-inch-per-foot (1/4 percent) slope downward toward drain.

3.8 DRAINAGE AND VENT PIPING INSTALLATION

- A. Install cast-iron soil pipe and cast-iron soil pipe fittings according to CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- B. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where 2 fixtures are installed back-to-back or side-by-side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.
- C. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:
 - 1. Sanitary Building Drain: 1/4 inch per foot (2 percent) for piping 3 inches and smaller; 1/4 inch per foot (2 percent) for piping 4 inches and larger.
 - 2. Horizontal Sanitary Drainage Piping: 1/4 inch per foot (2 percent).
 - 3. Storm Building Drain: 1/4 inch per foot (2 percent).
 - 4. Horizontal Storm Drainage Piping: 1/4 inch per foot (2 percent).
 - 5. Vent Piping: 1/8 inch per foot (1 percent).
- D. Sleeves are not required for cast-iron soil pipes passing through concrete slab, without membrane waterproofing, on grade.

3.9 JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Grooved Copper Tube and Grooved-Tube Fitting Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

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- C. Cast-Iron Soil Pipe and Cast-Iron Soil Pipe Fitting Joints: Make joints according to recommendations in CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Compression Joint: Make with neoprene gasket matching class of pipe and fittings.
 2. Hubless Joint: Make with neoprene gasket and sleeve or clamp.

3.10 ROUGHING-IN FOR WATER METER

- A. Install roughing-in piping and plumbing specialties specified in Division 15 Section "Plumbing Specialties" for water meter installation according to utility company's instructions and requirements.

3.11 VALVES

- A. Sectional Valves:
1. Install sectional valves close to main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated.
 2. Use gate or ball valves for sectional valves 2 inches and smaller.
 3. Use gate or butterfly valves for sectional valves 2-1/2 inches and larger.
- B. Shutoff Valves:
1. Install shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.
 2. For shutoff valves 2 inches and smaller, use gate or ball valves; for shutoff valves 2-1/2 inches and larger, use gate or butterfly valves.
- C. Drain Valves:
1. Install drain valves specified in Division 15 Section "Plumbing Specialties" on each plumbing equipment item located to drain equipment for service and repair. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.
- D. Check Valves:
1. Install swing check valve on discharge side of each pump and elsewhere as indicated.
 2. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping and MSS SP-71, Class 125, cast-iron body for 2-1/2-inch and larger piping.
- E. Balance Valves
1. Install valve in each hot-water circulating loop, discharge side of each pump, and elsewhere as indicated.
 2. Use ball valve for 2-inch and smaller piping and butterfly valve for 2-1/2-inch and larger piping.
- F. Install hose-end drain valves at low points in water mains, risers, and branches.
- G. Install stop and waste drain valves where indicated.

3.12 HANGERS AND SUPPORTS INSTALLATION

- A. Hanger and support devices are specified in Division 15 Section "Supports and Anchors."
- B. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

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Nom. Pipe Size (Inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Diameter (Inches)
Up to 3/4	7	5	3/8
1	7	6	3/8
1-1/4	7	7	3/8
1-1/2	9	8	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
3-1/2	13	11	1/2
4	14	12	5/8, 1/2 for copper
5	16	13	5/8, 1/2 for copper
6	17	14	3/4, 5/8 for copper
8	19	16	7/8, 3/4 for copper

C. Support vertical steel pipe and copper tube at each floor.

D. Conform to table below for maximum spacing of supports:

Pipe Material	Horizontal In Feet	Vertical In Feet
Cast Iron Soil Pipe	5	15
Copper Tubing - 1-1/4 Inches and Smaller	6	10
Copper Tubing - 1-1/2 Inches and Larger	10	10
Steel Pipe	12	15

E. Pipe Attachments: Install the following:

1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight horizontal runs 100 feet and less.
3. Adjustable Roller Hangers: MSS Type 43 for individual straight horizontal runs longer than 100 feet.
4. Spring Cushion Rolls: MSS Type 49, where indicated, for individual straight horizontal runs longer than 100 feet.
5. Pipe Rolls: MSS Type 44 for multiple straight horizontal runs 100 feet or longer. Support pipe rolls on trapeze.
6. Spring Hangers: MSS Type 52 for support of base of vertical runs.

F. Support cast-iron soil pipe and fittings not included in table, at maximum horizontal spacing of 5 feet, except 10-foot sections of pipe may be supported at 10-foot spacing and at maximum vertical spacing of 15 feet.

3.13 CONNECTIONS

- A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts of sizes indicated, but not smaller than required by plumbing code to fixtures.
- B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts, with approved trap, of sizes indicated, but not smaller than required by plumbing code, to plumbing fixtures and drains.
1. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.14 MECHANICAL EQUIPMENT CONNECTIONS

- A. Connect hot- and cold-water supply piping system to mechanical equipment as indicated.
- B. Provide shutoff valve and union for each connection; provide drain valve on drain connection.
- C. Use flanges instead of unions for connections 2-1/2 inches and larger.

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3.15 TESTING

- A. Inspect and test piping systems following the procedures of the authority having jurisdiction.

3.16 CLEANING

- A. Clean and disinfect water distribution piping following procedures of the authority having jurisdiction.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. This Contractor shall furnish all labor, material, equipment and services required to execute, install and complete, ready for use, all plumbing work including sanitary and water systems for the project, according to the drawings and these specifications.
- B. In general, the work to be done includes the furnishing and installing of all soil, waste, vent and drain piping; all hot and cold water lines and sanitary sewers inside the building, water service, gas piping and all other materials and equipment shown on the drawings and/or specified herein.
- C. The installation of the above piping shall be complete with all fixtures, traps, hangers, valves, anchors, supports, sleeves insulations and all other necessary material and labor as hereinafter specified and called for on the drawings, or required to furnish a plumbing system complete in every respect, according to the meaning and intent of the drawings and specifications and ready for satisfactory use.
- D. All work shall be installed in accordance with all applicable rules and regulations of the applicable local adopted codes, State or Federal agencies and/or other authorities having lawful jurisdiction.

1.3 JOB CONDITIONS

- A. Cutting, Patching and Digging:
 - 1. All cutting, drilling and patching of masonry, woodwork or plaster belonging to the building must be done by this Contractor in order that his work may be properly installed and all disturbed construction or finish must be made good but under no conditions must structural work be cut.
 - 2. Contractor shall also refer to the Architectural plans for details and large scale drawings and to the equipment shop drawings for exact locations of water and waste outlets for equipment furnished under other sections of these specifications. The above mentioned equipment shop drawings will be furnished to the Contractor before roughing-in. The Contractor shall not install any piping for said equipment until he has received approved shop drawings from the Architect for same.
- B. Excavation:
 - 1. This Contractor shall do all excavating and backfilling that may be required for the installation of any and all parts of this work requiring excavation.
 - 2. All excavations are to be so conducted that no walls or footing shall be disturbed or injured in any way.
- C. Trenches and Backfilling:
 - 1. Pipe trench excavation shall be made to required lines and grades. The width of the trench shall be such as to insure the proper making up of joints.
 - 2. The placing and tamping or backfill shall be uniform to insure the proper alignment of piping and avoid injury to any part of the work or the creation of unequal pressure. All backfill for excavations and trenches shall be clean sand or gravel free from silt, clay and loam. Do not backfill with material obtained from digging without prior approval. Backfill with clay will be allowed only for exterior trenches NOT under any paved areas.
 - 3. Tamp and puddle all trenches as required to avoid future settlement. Remove excess materials from the site, as may be required.
- D. Verification:
 - 1. The run of all lines shown on drawings is to be regarded as diagrammatic and tentative. Before running, Contractor shall carefully verify location, depth and size of sewers to which connection is proposed. Before running any lines within building, this Contractor shall assure himself that they can be run as contemplated without trapping or interfering with footings, beams, columns, other piping, fixtures, etc.

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1.4 GUARANTEE

- A. Plumbing Contractor shall guarantee and shall require guarantees from all manufactures furnishing equipment that furnishings comply with all the requirements of the drawings and specifications.

1.5 REFERENCED STANDARDS

- A. Piping Materials: The latest issue of the standard referred to shall apply to these materials.

Abbreviations are:

1. "ANSI": American National Standard Institute
2. "ASTM": American Society for Testing Materials
3. "FS": Federal Specifications and Standards
4. "AWWA": American Water Works Association

- B. Pipe and Fittings:

1. Cast Iron Soil Pipe and Fittings: ASTM A74.
2. Copper Drainage Tube (D.W.V.): ASTM B306.
3. Cast Bronze Solder Joint Drainage Fittings: ANSI B16.23.
4. Steel Pipes: ASTM A120.
5. Cast Iron Screwed Drainage Fittings: ANSI B16.12.
6. Cast Iron Flanged Joint Fittings: ANSI B16.1
7. Pipe Flanges and Flanged Fittings: ANSI B16.5.
8. Cast Iron Threaded Fittings: Class 125 and 250, ANSI B16.4.
9. Malleable Iron Threaded Fittings: Class 150 and 300, B16.3. ANSI
10. Seamless Copper tubing: ASTM B88.
11. Wrought Copper and Cooper Alloy Solder Joint Pressure Fittings: ANSI B16.22
12. Cast Copper Alloy Solder Joint Drainage: ANSI B16.23.
13. Cast Cooper Alloy Fittings for Flared Copper Tubes: ANSI B12.26.
14. Seamless Red Brass Pipe: ASTM B43.
15. Seamless Copper Pipe: ASTM B42.
16. Cast Bronze Threaded Fittings: Class 125 and 250, B16.15.
17. Bronze Pipe Flanges and Flanged Fittings: Class 150 and 300, ANSI

PART 2 - - PRODUCTS

2.1 SANITARY, STORM, GAS, WASTE AND VENT PIPING

- A. Fittings shall be radius fittings, except fittings in vent piping may be short radius fittings.
- B. Minimum size piping shall be 4 inches for buried piping and 1.5 inches for aboveground piping.
- C. Buried Piping
1. Buried piping includes piping up to but not more than 6 inches above ground or floor slab on grade.
 2. Cast-Iron Hub and Spigot Pipe and Fittings: ASTM A74 with ASTM C564 rubber compression gasket joints, or caulked lead and oakum joints.
- D. Aboveground Piping:
1. PVC Pipe & Fittings: SCH.40, solvent welded ASTM D-2241 and ASTM D-1785. (Where approved.)
 2. Cast-Iron Hub and Spigot Pipe and Fittings: ASTM A74 with ASTM C 564 rubber compression gasket joints, or caulked lead and oakum joints.
 3. Steel Pipe: ASTM A 53 or ASTM A 120, Schedule 40, hot-dip galvanized, threaded end connections; with ANSI B16, 12 hot-dip galvanized threaded fittings.
 4. Gas Piping: Black iron pipe ASTM A53 or ASTM 120 schedule 40 with malleable iron fittings.

2.2 CLEANOUTS

- A. Provide cleanouts in soil, waste and sewer lines at all changes of direction, dead-ends, and at 50 ft. intervals on horizontal runs. All cleanouts shall be full size of pipe but need not be larger than 4".

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- B. Cleanout extensions to unfinished floors inside building walls shall terminate in brass counter-sunk cleanout plugs set flush with the surface; provide JR Smith 4240 cast iron body, adjustable cast iron top.
- C. Cleanout extensions to finished floor inside building walls, shall terminate in standard brass cleanout plugs set below the floor and shall be provided as follows:
 - 1. Tile Finished Floor Areas: JR Smith 4160 cast iron ferrule with nickel brass square frame and secured cover recessed.
 - 2. Cleanouts - Walls: JR Smith 4452 cast iron ferrule, counter-sunk brass plug and round stainless steel cover. Coordinate location with Architect.

2.3 DOMESTIC WATER PIPING:

- A. Aboveground Piping: Piping aboveground shall be of the followings materials:
- B. 4 Inches and Smaller: Copper tubing, Type L hard drawn, conforming to ASTM B88, with brazed or solder joint copper, brass or bronze fittings conforming to ANSI B16.18 or ANSI B16.22 or brass pipe, standard weight IPS, 85 percent copper content conforming to ASTM B43 with standard weight threaded cast brass fitting conforming to ANSI B16.15.
- C. Exposed piping in finished areas shall be chrome plated brass pipe or Type L copper tubing to the shutoff or stop valve of each fixture.

2.4 WATER VALVES

- A. Provide valves suitable for minimum of 125 psig and minimum of 180 degrees F hot water. Valves shall have flanged end connections, except sizes smaller than 2.5 inches may have threaded end connections for connections between bronze valves and copper tubing. Copper alloy and bronze valve body shall be ASTM B61 or ASTM B62 copper alloy.
- B. Provide a shutoff valve at each equipment connection and at other points in the piping systems where indicated or reasonably required to stop or control flow. Contractor shall review piping layout before installation to assure positive control.
- C. The following valve figure numbers, taken from the current catalogs of valve manufacturers are intended to establish the general type and quality of valves required. Refer to Section 15050.
- D. 4 inches and smaller (copper pipe):
 - 1. Ball valves - Bronze body, chrome plated bronze ball, bronze stem, steel handle, Teflon seat, 400lb WOG; Watts No. B-6001 or Apollo No. 70-200, solder ends.
 - 2. Check valves - 200 lb., bronze body, regrinding bronze disc, swing check, solder ends; Crane No. 1342, Nibco No. S-413B, Stockham No. B-309, Walworth No. 3406-SJ.
- A. 2-1/2 in. and larger (steel pipe):
 - 3. Gate valves - 125lb., IBBM, solid wedge, OS&Y, rising stem, flanged; Crane No. 465-1/2, Nibco No. F-617-0, Stockham No. G-623, Walworth No. 8726-F.
 - 4. Globe valves - 200 lb., IBBM replaceable composition disc for 200 degree max., flanged; Crane No. 359, Nibco No. F-718-Y, Stockham No. G-514, Walworth No. 8914-F.
 - 5. Check valves - 125 lb., IBBM, swing check, re-grind renew bronze disc and seat ring, bolted cover, flanged; Crane No. 373, Nibco No. F-918-B, Stockham No. G-931, Walworth No. 8929-F.
 - 6. Gas solenoid valves equal to ASCO's.
- E. Balancing valves - Bell & Gossett circuit setter. Set at 1.0 GPM per circuit setter.
- F. Flow Control Valves - Provide flow restrictors for lavatories, sinks and showers without flow restrictors in accordance with all applicable codes.

2.5 DIELECTRIC CONNECTIONS

- A. Provide at connections between copper and ferrous metal piping materials. ASTM F 441, Schedule 80, CPVC threaded pipe nipples, 4-inch minimum length, may be provided for dielectric connections in pipe sizes 2 inches and smaller.

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2.6 MISCELLANEOUS PIPING MATERIALS

- A. Pipe Nipples: Fed. Spec. WW-N-351, copper alloy for use in copper tubing and hot-dip galvanized Schedule 80 steel pipe for use in steel piping.
- B. Unions: Fed. Spec. WW-U-516 for use in copper tubing; ANSI B16.39 hot-dip galvanized steel for use in steel piping.
- C. Escutcheon Plates: Provide one piece of split hinge type metal plates for piping passing through floors, walls and ceilings in exposed spaces. Provide chromium plated finish on plates in finished spaces. Provide paint finish on plates in unfinished spaces. Securely anchor plates in place with set screws or other approved positive means.
- D. Pipe Sleeves: Provide where piping passes through walls, floors, roofs and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors and partitions. Provide no less than 0.25-inch space between exterior of piping or pipe insulation and interior of sleeve. Firmly pack space with insulation and caulk at both ends of the sleeve with plastic water proof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.
 - 1. Sleeves in Masonry and Concrete Walls and Floors: Provide ASTM A53 or ASTM A120, Schedule 40 or Standard Weight, hot-dip galvanized steel pipe sleeves. Extend sleeves in floor slabs 3 inches above the finished floor, except sleeves are not required where DWV piping passes through concrete floor slabs located on grade.
 - 2. Sleeves in Partitions and Other than Masonry and Concrete Walls and Floors: Provide hot-dip galvanized steel sheet having a nominal weight of not less than 0.90 pounds per square foot.
- E. Pipe Supports (Hangers): Provide MSS SP-58 and MSS SP-69, Type 1 or 6, of the adjustable type, except as indicated or specified herein. Provide Type 40 insulation protection shields for insulated piping. Provide steel support rods. Provide nonmetallic, hair felt, or plastic piping isolators between copper tubing and the hangers.

2.7 FIXTURES, FITTINGS, ACCESSORIES AND SUPPLIES

- A. Provide control-stop valves in each supply to each fixture. The finish of fittings, accessories, and supplies exposed to view shall be chromium-plated. Center-set faucets shall be top-mounted with inlets on not greater than 4-inch centers. Provide special roughing-in for the elderly and wheelchair fixtures.
 - 1. See drawings for plumbing fixture schedule.

2.8 HOT WATER RECIRCULATION PUMPS

- A. Bronze body, in-the-line centrifugal type with resiliently mounted 1750 RPM motor, built-in thermal overload protection, spring type flexible coupling, oil lubricated bearings, mechanical seal and flanged connections.
- B. Pump motor cradles shall be supported from the building structure independent for the piping in an approved manner.
- C. 10 Gal/Min at 10 ft. head 1/6 HP, 120V, 1-phase.
- D. Bell and Gossett 1" PR. TACO, or approved equal.

2.9 GAS FIRED WATER HEATER

- A. See Schedule on drawing.

2.10 PLUMBING FIXTURES

- A. See Schedule on drawing.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of plumbing systems including fixtures, equipment, materials and workmanship shall be in accordance with the State and Local Plumbing Code.

3.2 CROSS CONNECTIONS AND INTERCONNECTIONS

- A. No plumbing fixture, device equipment, or pipe connection shall be installed that will provide a cross connection or interconnection between potable water supply and any source of non-potable water, such as a drainage system, a soil or waste pipe.

3.3 CLEANOUTS, CLEARANCE AND PROTECTION

- A. Use blanked tees at 90 degree bends to provide cleanout capability. Locate cleanouts in floor a minimum of one foot from walls and installed equipment in order to provide proper access. Provide ample space for piping and take particular care to avoid structural interference and conflicts between several types of mechanical and electrical work.

3.4 CLEANING AND PROTECTION OF PIPE, FIXTURES, MATERIALS AND EQUIPMENT

- A. Before being placed in position, carefully clean pipe internally as well as externally and fittings. Maintain all pipe in a clean condition. Close pipe openings with caps or plugs during installation. Tightly cover fixtures and equipment and protect against dirt, water and chemical or mechanical injury. Upon completion of all work, thoroughly clean, adjust, and operate the fixtures, materials and equipment.

3.5 BELL AND SPIGOT CAST IRON SOIL PIPING

- A. Lay non-pressure pipe with the bell ends in the upgrade position. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots is not permitted. Replace by one of proper dimensions any pipe or fitting that does not allow sufficient space for proper caulking or installation of joint material. Make joints with the rubber gaskets previously specified for joints with this piping, except that where it is impractical to install rubber gasket joints, use leaded joints. Install rubber gasket joints in accordance with the recommendations of the pipe manufacture. Make leaded joints in the following manner: Pack braided or twisted oakum or hemp gaskets into the annular space between bell and leading. Do not allow gaskets to project into the bore of finished joints. After gaskets are placed, clean the joints and fill the remaining space with one pouring of lead. Caulk lead in a manner that will assure a tight joint without overstraining the iron of the bell, and so that after caulking, the lead will be practically flush with the base of the ball.

3.6 SANITARY SYSTEMS

- A. Provide sanitary systems where practicable, with Y fittings and 1/8- or 1/16-bends or combination Y- and 1/8-bends. All fixtures not specified to be provided with traps as integral parts of their outfits and all drains shall have separate traps with cleanouts. Waste lines shall be not less than 1-1/2 inches in diameter. Individually vent all fixtures or connect to a vented soil or waste line. Horizontal vents shall slope down from waste or soil branch or stack. Grade horizontal soil and waste piping 1/4 inch per foot for 3-inch size and smaller and 1/8 inch per foot for 4 inch and larger increasers shall be installed on the top of each soil stack and vent stack before same passes through roof.

3.7 FITTINGS

- A. Changes in pipe size on soil, waste and drain lines shall be made with reducing fittings. Changes in direction shall be made by the use of fittings.

3.8 TRAPS

- A. Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap. Each trap shall be placed as near the fixtures as possible and no fixture shall be double-trapped. Traps installed on cast iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tube shall be recess-drainage patten, or brass-tube type.

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3.9 WATER SYSTEMS

- A. Install water systems with a fall towards the shut-off valve of the lowest fixture. Provide valve branches on hot and cold water lines to all fixtures, water heating units, and outlets as indicated on drawings or as noted in specifications.

3.10 MAINS, BRANCHES AND RUNOUTS

- A. Piping shall be installed as indicated. Pipe shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Piping shall be run parallel with the lines of the building. Branch pipes from service lines may be taken from top, bottom or side of main, using such crossover fittings as required by installation conditions. Supply pipes, valves and fittings shall be kept a sufficient distance from other work and other service to permit not less than 1/2 inch between finished covering and other work not less than 1/2 inch between finished covering on the difference services. The hot water and cold water piping systems shall be installed so as to be drained.

3.11 AIR CHAMBERS

- A. Air chambers shall be provided on hot and cold water supplies and shall be accessible. Air chambers shall consist of 12-inch length of pipe of the same diameter as the branch supply, capped.

3.12 VALVES

- A. Install valves in accessible places and locate as follows: shut-off valves on each supply to each piece of equipment, at the bottom of each riser and at each branch connection off the main piping system.

3.13 INSTALLATION OF FIXTURES

- A. Provide all necessary material and labor to connect to the plumbing system all fixtures and equipment having plumbing connections, which are furnished under fit-up package work or are specified in other sections of these specifications. Trap drainage connections. Equipment the supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with an integral stop with a stop valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Anchor supply piping to all fixtures, and flush valves to prevent movement. Make connections between the earthenware of fixtures and the flanges on soil pipe watertight with one-piece special molded plastic gasket. Do not use any bulk material including putty and plastics for gaskets. Secure floor drains to the waterproofing or flashing in watertight manner.

3.14 THREADED CONNECTIONS

- A. Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape, pipe cement and oil, or PTFE powder and oil; apply only on male threads. Provide exposed ferrous pipe threads with one coat of Fed. Spec. TT-P-645 primer applied to a minimum dry film thickness of 1.0 mil.

3.15 PIPE HANGERS AND SUPPORTS

- A. Provide adjustable hangers, saddles, inserts, brackets, rollers, clamps, supplementary steel, etc., as required for proper support of all pipelines. Hangers shall be designed to allow for expansion and contraction of pipelines and shall be of adequate size to permit covering to run continuously through hangers. Coordinate location of hangers with light fixtures as shown on electrical drawings. Hangers provided under other sections shall not be used for support of piping or equipment provided under this section unless the Architect grants permission in writing. Hangers shall be of manufacture and type specified, or approved equal.

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1. Single Hangers: Support single pipe runs with clevis type hangers.
2. Trapeze Hangers: Support multiple pipe runs on trapeze type hangers. Provide all necessary supporting steel rollers to keep pipe in alignment and allow for expansion. Concealed trapeze hangers shall be Unistrut.
3. Supporting Spacing: Pipe support spacing and sizes of pipe-hanging suspension rods shall conform to the following table:

<u>Pipe Spacing:</u>	<u>Pipe Supporting Spacing</u>
1/2" and 3/4"	Not over 6'-6"
1" and 1-1/4"	Not over 8'-6"
1-1/2"	Not over 10'-0"
2" and 2-1/2"	Not over 12'-0"
4" and Larger	Not over 16'-0"

<u>Pipe Size</u>	<u>Rod Diameter</u>
Up to 2"	3/8"
2-1/2" to 3-1/2"	1/2"
4" and Larger	5/8"

For caulked bell-and-spigot piping provide a hanger for each section of pipe, located at shoulder of bell.

4. Fastening Devices
 - a. Drilled-In Threaded Inserts: Where supports in beams and slabs are required after concrete and has been poured, Drilled-In Threaded Inserts or Self Drilling Expansion Shields shall be provided, installed in accordance with manufacturer's recommendations as to maximum loading, but in no case more than 10'-0" apart.
 - b. Expansion Anchors and Powder-Actuated Fasteners and Devices: The use of lead shield anchors or powder-actuated fasteners and devices is not permitted.

3.16 SUPPLEMENTARY STEEL

- A. Provide all necessary supplementary steel or proper support or attachment of hangers. Steel shall be painted with one coat of rust-inhibiting primer.

3.17 SADDLES

- A. Provide protection saddles at hanger points of insulated pipe. Saddles shall be Crawford Fig. 35 or equal.

3.18 EXPANSION SWINGS

- A. At connections of branches to mains and risers at connections to equipment provide sufficient number of elbow swings to allow for proper expansion and contraction of piping. Provide adequate elbow swings through building expansion joints to allow for proper expansion and contraction of piping mains.

3.19 VACUUM BREAKERS

- A. Where the possibility of back-siphonage exists, water supplied to the fixture shall be introduced through a suitable vacuum breaker installed at a minimum of 7'-6" above the floor, or integral with faucet. This is based on municipal codes.

3.20 TESTING AND STERILIZING

- A. All new soil, waste and vent piping before covered up to be stopped at outlets and tested with a water pressure of 5 lbs. for a period of one hour.
- B. All new water piping and mains upon completion before being covered shall be treated to a hydrostatic pressure of 50% more than maximum system pressure, but no less than 100 psig of pressure for a 2 hour period.
- C. Any additional tests, if required by local authorities, to be as directed by them.

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- D. If tests show any leaks in the pipe or at joints, same are to be made tight and tests repeated; tests to be made in the presence of the Owner or those in authority and the cost of all tests paid by the Plumbing Contractor.
- E. Upon completion of all testing and closing of leads, all new water mains shall be sterilized in accordance with the requirements of the State Board of Health and those of the local governing authorities.

3.21 CLEANING UP

- A. After the completion of the plumbing installation, this Contractor shall clean foreign paint, grease, oil, dirt, labels, stickers, etc., from all fixtures, apparatus, equipment and interior piping installed by him. Contractor shall remove all rubbish, debris, etc., accumulated from his operations from the premises.

3.22 FIELD DRAWINGS

- A. Maintain 2 sets of drawings corrected with colored pencil showing exact locations of equipment, piping, valves, etc., with such dimensions as re necessary to identify services. Furnish "as built" drawings to the Owner's operating and maintenance personnel.

END OF SECTION

CHASE
SECTION 230013 - HVAC GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, material and equipment called for in these Specifications and accompanying Drawings and shall install the system complete in every respect. All purchased equipment to comply with local system complete in every respect.

1.3 RELATED SECTIONS

- A. Sections 220700 through 238239

1.4 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. The following general rules and requirements apply to the interpretation of all phases of the drawings and specifications.
- B. Drawings for the work consist of a complete set of plans and specifications, to which will be added during the period of construction any other detail drawings as may be necessary in the opinion of the Architect to show the proper installation of the work.
- C. The dimension and ratings of equipment herein specified or indicated on the drawings are intended to establish the outlined characteristic of such equipment generally.
- D. Where manufacturer's catalog numbers or types are mentioned in the specifications or indicated on the drawings, they are intended to be used. In all cases the manufacturer shall verify the duty specified with the particular characteristics of the equipment they intend to supply. The manufacturer of equipment is cautioned to consult other applicable articles in the specification, particularly those in motors, starters, etc.
- E. The drawings and accompanying specifications are to be considered as an important and integral part of same, and anything omitted from one and embodied in the other is to be considered as essential to the requirements of the Contract and must be furnished and installed by the Contractor.
- F. Equipment that does not fit into available building spaces will not be approved regardless of whether the make is approved.
- G. No important dimensions shall be obtained by scaling a drawing; important dimensions and elevations shall be determined by computing from the established dimensions and reference points given on the Architect's drawings. Site grade elevations shall be determined from the Architect's site drawings. However, it is not the intention of the drawings to indicate all necessary offsets in piping and ductwork in such a manner as to conform to structure, avoid obstructions, preserve head room and keep all openings and passageways clear without further construction.
- H. It is intended that apparatus shall be located symmetrically with Architectural elements, notwithstanding the fact that locations indicated by the drawings may be distorted for clearness in presentation.
- I. Where discrepancies are found by the Contractor after signing the Contract between the Specification, Sections, or between drawings, or any contradictory sizes or plate numbers describing the manufacturer's item, such shall be brought to the attention of the Architect and the Architect shall determine the proper items to be used with no additional cost to the Owner.

1.5 COOPERATION AND COORDINATION

- A. Coordinate procurement and installation of HVAC control devices with the project electrician.
- B. Contractor shall confer with other trades at the site before installation of his work to avoid interferences so that maximum headroom and clearances may be maintained. In the event that interferences develop between work and various trades, the Owners decision will be final and no additional compensation will be allowed for the moving of misplaced work.

- C. Particular attentions shall be paid to situations where recessed equipment, pipes and lights occur, or where the work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.
- D. It is presumed that the Contractor has carefully examined the drawings and specifications for the entire work and the job conditions that will ensue before executing the agreement and has reported to the Architect in writing any interference of conflicts with his work. If the Contractor has failed to call such interferences of conflicts relative to this work, the drawings, specifications, the work of other trades, and job conflicts arise during the construction period, they shall be submitted and subjected to the Architect's decision, all changes made and all damage to construction shall be repaired by the Contractor without additional cost.
- E. All fixtures, equipment, devices, switches, outlets, pumps, etc., shall be positioned to avoid all interferences with and to assure proper coordination with the work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc. shall be coordinated with all wall, floor and ceiling patterns. The Architect will work out the conflicts and adjustments where such adjustments are warranted.

1.6 WORK PRIORITY OVER OTHER TRADES

- A. All trades shall work in cooperation with one another to fit piping and ductwork into the structure as job conditions may demand. The Architect shall make all final decisions as to right of way and run of pipe, ducts, etc.
- B. In general, priority is to be arranged as follows:
 - 1. Recessed lighting fixtures.
 - 2. Sheet metal ductwork.
 - 3. Plumbing waste lines, downspouts and vents.
- C. All reinforcing of joists and studs shall be kept at an absolute minimum, and when it is necessary shall be only as approved by the Architect and local code. Where notching is permitted it shall be narrow and as shallow as possible. The Contractor as required for his work shall do all notching unless otherwise noted on the drawings.
- D. All equipment, devices, ducts, fixtures, hangers, etc. shall be securely and permanently hung from supporting walls, ceilings, etc. as approved.

1.7 CUTTING AND PATCHING

- A. Each Contractor shall do all cutting and patching of building materials required for the installation of work in his contract. No structural members shall be cut without the approval of the Architect and all cutting shall be done in a manner as directed by him.

1.8 DEFECTIVE WORK AND MATERIAL

- A. All material or work found to be defective or not in strict conformity with the drawings or different from the requirements of the drawings and specifications or defaced or injured through negligence of the Contractor or his employees, or through the action of fire or weather will be rejected and shall be immediately removed from the premises by the Contractor and satisfactory material and work substituted therefore without delay.
- B. Any defective work or imperfect work that may be discovered shall be corrected immediately on notice. No previous inspection or certificate on account shall behold to relieve the Contractor from his obligation to furnish sound material and to perform good and satisfactory work.

1.9 CHASES AND OPENINGS

- A. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located and shall do any cutting and patching caused by the neglect to do so.

1.10 INSERTS AND SLEEVES

- A. Layout the work in accordance with approved shop drawings. Furnish and set in place in advance of pouring of slabs or construction of walls, all inserts, and sleeves necessary to complete the work. The use of lead shield anchors or power-actuated fasteners and devices is not permitted.

CHASE
SECTION 230013 - HVAC GENERAL PROVISIONS

1.11 EXCAVATING AND BACKFILLING

- A. Contractor shall provide all excavating, backfilling and removal of unused excavated material not used for trenches required to install his underground work inside the building.
- B. Trenching: Excavate to the require depths and grade bottoms of trenches to secure required slit for pipelines or ductwork. Where mud or otherwise unstable soil is encountered in the bottom of the trenches which is incapable of supporting the pipe such soil shall be removed to firm bearing and the trenches backfilled with sand and the proper grade and tamped to provide uniform firm support. Pipe and ducts shall not be laid on frozen sub-grade.
- C. Sides of trenches at a point 1" above top of pope shall not be more than the O.D. of the pipe or duct, expressed in inches, plus 12". Above this point the sides of trenches shall be kept as nearly vertical as possible and braced and shorted to protect foundations, utility pipe lines and workmen.
- D. The bottom of the trench shall be accurately excavated by hand to provide firm, uniform bearing for the bottom quarter of the pipe or duct. Pipe having bells, sleeves or other enlargement at the joints shall have recesses excavated to accommodate these joints.
- E. Backfilling: Trenches shall not be backfilled until piping has been tested by the Contractor as required and approved by the Owner and/or any local authorities having jurisdiction.
- F. All trenches inside the building shall be backfilled to the top which clean sand and compacted by hand tamping.
- G. Backfill for the remainder of the trench shall be of selected excavated material placed in layers which, when compacted, will not exceed 1'-0". All backfilling shall be well rammed in place at the sides and puddled every foot in height.

1.12 CLEANING UP

- A. See General Conditions, which form a part of this section.
- B. Contractor during the process of the work shall keep the premises reasonably free of all debris and waste materials resulting from the work under this section. All such debris and rubbish shall be removed from the site. On completion and before final acceptance of the work, all debris, rubbish, leftover materials, tools, and equipment shall be removed from the site.
- C. Machinery, apparatus, exposed piping and insulation shall be thoroughly cleaned of cement, plaster and other materials, grease and oil spots removed with cleaning solvent, surfaces carefully wiped, cracks and corners scraped clean.
- D. Failure of the Contractor to clean up as required will be cause for the Architect to order this work done by others at the expense of this Contractor.

1.13 PROTECTION

- A. Each trade shall keep all of its respective pipe and duct openings closed by means of plugs or caps to prevent the entrance of foreign matter, and cover the fixtures, equipment and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation. Any such fixtures, equipment or apparatus damaged prior to final acceptance of the work shall be restored to its original condition or replaced by the respective mechanical trade at no cost to the Owner.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Contractor shall arrange for all technical instructions of Owners maintenance personnel, either by this own or the equipment manufacturer's personnel. A letter shall be written to the Engineer prior to these instruction days so that he can attend.
- B. Manuals: Furnish three (3) sets of manuals, in bound form, hard cover, each containing data covering capacities, maintenance and operation of each major item of equipment and apparatus. Operation instructions shall cover all phases of control and shall also include the following:
 - 1. Performance Curves: For fans and similar equipment at the operating conditions.
 - 2. Lubrication Schedule: Indicating type and frequency of lubrication required.
 - 3. List of Spare Parts: Recommend for normal service requirements.

SECTION 230013 - HVAC GENERAL PROVISIONS

4. Part List: Identifying the various parts of the equipment for repair and replacement purposes. In particular, sheaves, V-belts, bearings and similar items should be clearly identified as to manufacturer, size, and type and stocking points.
- C. Instruction books may be standard booklets but should be clearly marked to indicate applicable equipment and paragraphs.

1.15 APPROVALS

- A. Prior to the commencement of work or the installation of any equipment this contractor must obtain approval from the Architect/Engineer. Requests for approvals shall be made through the Architect. No less than six (6) copies are required. No portion of the work requiring approval shall be commenced until said portion has been returned bearing the Architect/Engineer's approval or a letter stating it has been accepted and approved.

1.16 SHOP DRAWINGS

- A. See General Conditions that form a part of this section.
- B. All shop drawings shall have the following information:
 1. Date Submitted.
 2. Name and location of the project.
 3. Name of the Architect and Consulting Engineer.
 4. Name of the equipment manufacturer and supplier.
 5. Specification reference - Division, Section and Paragraph.
 6. System and area being served by the item being submitted.
 7. Plan location (either room name and number or column line cross reference) of the item being submitted.
 8. Capacity of item being submitted (CFM, GPM, HP, MBH, RPM, etc.)
 9. Outline dimensions.
 10. Operating clearance.
 11. Engineering data to include substantial compliance with the specifications.
- C. Where equipment data forms a part of a larger catalog containing other unrelated apparatus, the pertinent pages shall be removed and submitted separately with marking to indicate the specific item offered for approval.
- D. Each manufacturer's shop drawings submitted shall also have a typewritten short description of general maintenance required weekly, monthly, quarterly, semi-annually, and annually (NOT STANDARD MAINTENANCE MANUALS). The following information shall also be shown: equipment model, serial number, phone number of service company, sizes, type, and numbers of motors, coils, filters, pumps, belts, bearings, type of lubrication used, etc.
- E. Also submit piping and duct layout shop drawings showing clearances, etc.

1.17 RECORD DRAWINGS

- A. Contractor shall keep on the job one complete set of the contract working drawings on which he shall record any deviations or changes from such drawings made during construction. Record drawings shall show change in size, type, capacity, etc. of materials, device or piece of equipment, location of any outlet or source in building service system, re-routing of any piping or other building services.
- B. These drawings shall also record the location of all concealed services, piping and other equipment by indication of measured dimensions to each such line from readily identifiable and accessible walls or columns of the building. Drawings shall show elevations of duct runs etc.
- C. When the project is completed and as a condition of final payment, the Contractor shall certify to the accuracy of the record drawings and specifications by endorsement thereof and shall require each Subcontractor to so certify by endorsement of the record drawings and specifications for his portion of the work, and deliver same to the Owner, together with copies of all change orders and shop drawings, in accordance with the General and Supplementary General Conditions.

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1.18 GUARANTEE

- A. Each Contractor shall and hereby does guarantee and warranty all work and material performed and installed by him directly or by any of his subcontractors against defective and inferior materials and workmanship for a period of one (1) year from the date of acceptance. All guarantees shall be in writing and delivered to the Owner before final certificates are issued. Contractor shall make good at his own expense and without cost of the Owner any and all defective and inferior materials and workmanship that develop within the guarantee period.

1.19 PAINTING

- A. The following equipment shall have a manufacturer's standard finish, equivalent to baked enamel, of the type and color approved by the Architect, and shall not be job painted:
1. HVAC Units
 2. Grilles, Registers & Diffusers
 3. Control Panels
 4. Fans
 5. Motors
 6. Electric Wall Heater
 7. Unit Heaters
- B. All priming and painting shall conform to all requirements of the painting specifications and the Architect shall select all types and colors.
- C. Piping, conduit, ductwork, etc. which are in walls, floors, or above a finished ceiling shall not be painted.
- D. Exposed ductwork.

1.20 BELT AND COUPLING GUARDS

- A. Guards shall be provided for all belt-driven units and at chairs, gears, couplings, keys projecting set screws, and other rotating or moving parts. Belt guards shall be made to enclose both pulleys and belts on exposed sides, and shall be constructed of galvanized steel top and bottom with expanded metal front pitted and locked into rim. The entire assembly shall be rigidly supported with all necessary supplementary steel, and shall be provided for greasing, oiling, adjusting, checking of equipment, etc. Provide coupling guards on direct connected units. Guards shall be designed for easy removal for service and shall comply with Underwriters' Safety Requirements, and OSHA Requirements.

1.21 FLOOR AND CEILING PLATES

- A. On all exposed pipes passing through floors, walls, partitions, plaster furring, etc., provide 1" split-type steel plates around them. In unfinished rooms, plates shall be prime coated, in furnished rooms, plates shall be chrome plated.

1.22 MINOR DEVIATIONS

- A. The dimensions and ratings of equipment herein specified or indicated on the drawings are intended to establish the desired outlines and characteristics of such equipment. Minor deviations will be permitted to allow manufacturers specified to bid their nearest stock equipment.
- B. Manufacturers catalog or model numbers and types mentioned in the specifications or indicated on the drawings are intended to be used as guides and shall not be interpreted as taking precedence over specific ratings or duty called for or shown, which modify stipulations in such catalogs. In all cases, the manufacturer shall verify the duty specified with the particular characteristics of the equipment he intends to offer for approval, and shall offer only items that comply with specification requirements.

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SECTION 230013 - HVAC GENERAL PROVISIONS

- C. Where the equipment furnished differs in physical character from that specified or indicated, or where Contractor's substituted equipment requires increased services and/or facilities to be provided by other trades, and such substitutions is acceptable to the Owner. The Contractors making the substitutions shall pay for such services and facilities and shall bear all costs for modifying the building to receive the product.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, material and equipment called for in these Specifications and accompanying Drawings and shall install the system complete in every respect.
- B. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems, all pressure ranges;
 - 2. Return air systems;
 - 3. Exhaust air systems;
 - 4. Verify temperature control system operation.
- C. Test systems for proper sound and vibration levels.
- D. This Section does not include:
 - 1. Testing boilers and pressure vessels for compliance with safety codes;
 - 2. Specifications for materials for patching mechanical systems;
 - 3. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.
 - 4. Requirements and procedures for piping and ductwork systems leakage tests.
- E. Certified Reports:
 - 1. Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer.
 - 2. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems.
 - 3. Follow the procedures and format specified below.
- F. Report Format:
 - 1. Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced.
 - 2. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders.
 - 3. Provide binding edge labels with the project identification and a title descriptive of the contents.
 - 4. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary
 - b. Air Systems
 - c. Temperature Control Systems
 - d. Special Systems
 - e. Sound and Vibration Systems
- G. Report Contents: Provide the following minimum information, forms and data:
 - 1. General Information and Summary:
 - a. Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project.
 - b. Include addresses, and contact names and telephone numbers.
 - c. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer.
 - d. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.

- H. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

1.3 TEST AND BALANCE ENGINEER'S QUALIFICATIONS

- A. A Professional Engineer (either on the installer's staff or and independent consultant), registered in the State in which the services are to be performed, and having at least 3-years of successful testing, adjusting, and balancing experience on projects with testing and balancing requirements similar to those required for this project.

1.4 CODES AND STANDARDS

- A. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- B. AABC: "National Standards For Total System Balance".
- C. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

PART 2 - PRODUCT

2.1 SYSTEMS OPERATION

- A. Systems shall be fully operational prior to beginning procedures.

PART 3 - EXECUTION

- A. Test, adjust, and balance the air systems before steam and refrigerant systems.
- B. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg. F wet bulb temperature of maximum summer design condition, and within 10 deg. F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.
- C. Before operating air systems, perform these steps:
 - 1. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
 - 2. Check filters for cleanliness.
 - 3. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 - 4. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.
 - 5. Determine best locations in main and branch ductwork for most accurate duct traverses.
 - 6. Place outlet dampers in the full open position.
 - 7. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
 - 8. Lubricate all motors and bearings.
 - 9. Check fan belt tension.
 - 10. Check fan rotation.
- D. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- E. Provide instruments meeting the specifications of the referenced standards.
- F. Use only those instruments that have the maximum field measuring accuracy and are best suited to the function being measured.
- G. Apply instrument as recommended by the manufacturer.

CHASE

SECTION 230593 – TESTING, ADJUSTING AND BALANCING FOR HVAC

- H. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- I. When averaging values, take a sufficient quantity of readings, which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- J. Take all reading with the eye at the level of the indicated value to prevent parallax.
- K. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- L. Take measurements in the system where best suited to the task.
- M. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- N. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- O. Patch insulation, ductwork, and housings, using materials identical to those removed.
- P. Seal ducts and piping, and test for and repair leaks.
- Q. Seal insulation to re-establish integrity of the vapor barrier.
- R. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- S. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.
- T. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.
- U. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards.
- V. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

END OF SECTION

CHASE
SECTION 230713 – DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
 - 5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
 - 6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
 - 7. Indoor, concealed oven and warewash exhaust.
 - 8. Indoor, exposed oven and warewash exhaust.
 - 9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 11. Outdoor, concealed supply and return.
 - 12. Outdoor, exposed supply and return.
- B. Related Sections:
 - 1. Division 23 Section "HVAC Equipment Insulation."
 - 2. Division 23 Section "HVAC Piping Insulation."
 - 3. Division 23 Section "Metal Ducts" for duct liners.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.
- C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM 871.

- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Fibrex Insulations Inc.; FBX.
 - c. Johns Manville; 800 Series Spin-Glas.
 - d. Knauf Insulation; Insulation Board.
 - e. Manson Insulation Inc.; AK Board.
 - f. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; FlameChek.
 - b. Johns Manville; Firetemp Wrap.
 - c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
 - d. Thermal Ceramics; FireMaster Duct Wrap.
 - e. 3M; Fire Barrier Wrap Products.
 - f. Unifrax Corporation; FyreWrap.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.

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SECTION 230713 – DUCT INSULATION

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

2.9 SECUREMENTS

- A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, wing seal.
- B. Insulation Pins and Hangers:
 1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
 - 2) GEMCO; Perforated Base.
 - 3) Midwest Fasteners, Inc.; Spindle.

2.10 CORNER ANGLES

- A. PVC Corner Angles: 30 mils (0.8 mm) thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

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3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) 4 inches (100 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

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1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

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- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
 5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.

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4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.7 FINISHES

- A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed supply and outdoor air.
 2. Indoor, exposed supply and outdoor air.
 3. Indoor, concealed return located in unconditioned space.
 4. Indoor, exposed return located in unconditioned space.
 5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
 6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
 7. Indoor, concealed oven and warewash exhaust.
 8. Indoor, exposed oven and warewash exhaust.
 9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 11. Outdoor, concealed supply and return.

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12. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

INTERIOR CONCEALED HVAC SUPPLY AND RETURN DUCTS AND PLENUMS,
RECTANGULAR/SQUARE

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D
GLASS FIBER	LINER	1	(MATT-FACED)

INTERIOR EXPOSED HVAC SUPPLY AND RETURN DUCTS AND PLENUMS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D
GLASS FIBER	BLANKET	1	(FOIL-FACED)

END OF SECTION

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, material and equipment called for in these Specifications and accompanying Drawings and shall install the system complete in every respect. Work shall include but not be limited to the following:
 - 1. Piping
 - 2. Valves
- B. Approximate values of natural gas that will be supplied for these systems have heating value of 1000 BTU/cu. ft.
- C. System Performance Requirements: Except where otherwise indicated, the minimum pressure requirements for these systems are 0.3 psig.
- D. Submittals: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for each type of natural gas specialty and special-duty valve. Include pressure rating in psig, rated capacity in cu.ft. per hour (CFH), and settings of selected models.
- E. Comply with NFPA 54 "National Fuel Gas Code" for piping materials and components; installations, and inspections, testing and purging.
- F. Comply with NFPA 70 "National Electrical Code" for electrical connections between wiring and electrically operated control devices.
- G. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.
- H. Listing and Labeling: Provide equipment and accessories that are listed and labeled.
 - 1. Terms "Listed" and "Labeled": As Defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

- A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere. Coating properties include:
 - 1. Applied to pipe and fittings treated with a compatible primer prior to application of tape.
 - 2. Overall Thickness: 20 mils, synthetic adhesive.
 - 3. Water Vapor Transmission Rate: Maximum 0.10 gallon per 100 square inches.
 - 4. Water Absorption: 0.02 percent maximum.
- B. Steel Pipe: ASTM A53, Type E, Electric-Resistant Welded or Type S, Seamless, Grade B, Schedule 40, black.
- C. Steel Fittings: ASME B16.9, wrought steel, butt-welding type; and ASME B16.11, forged steel.
- D. Steel Flanges and Flanged Fittings: ASME B16.5.
- E. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.
- F. Transition Fittings: Type, material, and end connections to match piping being joined.
- G. Common Joining Materials: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.
- H. Joint Compound and Tape: Suitable for natural gas.

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SECTION 231123 - FACILITY NATURAL GAS PIPING

- I. Gasket Material: Thickness, material, and type suitable for natural gas.
- J. Manual Valves: Conform to standards listed, or where appropriate, to ANSI Z21.15 and ANSI Z21.15a.
- K. Gas Stops, 2 Inches and Smaller: AGA-certified design for 2 psig or less natural gas, with AGA stamp, plug or ball type, bronze body and bronze plug or chrome-plated brass ball. Include flat head, square head, or lever handle and threaded ends. Include locking (tamperproof) feature.
- L. Gas Valves, 2 Inches and Smaller: ASME B16.33, 125 psi WOG, cast-iron body, bronze plug, straightaway pattern, square head, tapered-plug type, with threaded ends. Include locking (tamperproof) feature.
- M. Gas Valves, 2-1/2 Inches and Larger: MSS SP-78, Class 125 or 175 WOG, lubricated plug type, semi-steel body, wrench operated, with flanged ends. Include locking (tamperproof) device feature.
- N. Automatic Shutoff Valves: ANSI Z21.21 or ANSI Z21.21a, for operation by appliance automatic shutoff device. Valves 2 inches and smaller shall have threaded ends and 2-1/2 inches and larger shall have flanged ends. Provide for mechanical or automatic operation as indicated.
- O. Solenoid Valves: Cast-iron body; 120 volts a.c., 60 HZ, Class B continuous-duty molded coil; UL labeled and FM approved. Include ISC 6, NEMA 4 coil enclosure and electrically opened and electrically closed dual coils. Valve position is normally closed. Include threaded ends for 2 inches and smaller and flanged ends for 2-1/2 inches and larger.
- P. Flexible Connectors: ANSI Z21.24 or ANSI Z21.24a, copper alloy.
- Q. Strainers: Y pattern, full size of connecting piping. Include Type 304 stainless-steel screens with 3/64-inch perforations except where other screens are indicated.
 - 1. Pressure Rating: 125 psig minimum steam or 175 psig WOG working pressure except where otherwise indicated.
 - 2. Sizes 2 Inches and Smaller: Bronze body, with female threaded ends.
 - 3. Sizes 2-1/2 Inches and Larger: Cast-iron body, with flanged ends.
 - 4. Screwed screen retainer with centered blowdown and pipe plug.

PART 3 - EXECUTION

3.1 GENERAL

- A. Precautions: Close equipment shutoff valves before turning off gas to the premises or section of piping. Perform leakage test to determine that all equipment is turned off in the piping section to be affected.
- B. Comply with NFPA 54 "Prevention of Accidental Ignition."
- C. Extend natural gas piping and connect to gas distribution system (gas service) piping in location and size indicated for gas service entrance to building.
 - 1. Gas distribution system piping, service gas pressure regulator, and gas meter will be provided by gas utility.
- D. Install shutoff valve, downstream of gas meter, outside building at gas service entrance.
- E. Pipe Applications: Flanges, unions, transition and special fittings, and valves with pressure ratings same or higher than system pressure rating may be used in applications below, except where specified otherwise.
 - 1. 2 Inches and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.
 - 2. 2-1/2 Inches and Larger: Steel pipe, butt-welding fittings, and welded joints.
 - 3. Natural Gas Systems, Buried within Building: Use steel pipe, butt-welding fittings, and welded joints. Encase gas carrier piping in containment conduits.
 - 4. Underground Containment Conduits: Use steel pipe, butt-welding fittings, and welded joints.

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- F. Use low-pressure gas stops, tapered plug or ball type, for shutoff to appliances with 2-inch or smaller gas supply.
- G. Use gas valves for shutoff to appliances.
- H. Use gas valves of sizes indicated for gas service piping, meters, mains, and where indicated.
- I. Joint Construction: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
 - 1. Use materials suitable for natural gas service.
- J. Refer to Division 22 for basic piping installation requirements.
- K. Concealed Locations: Except as specified below, install concealed gas piping in an air-tight conduit constructed of Schedule 40 seamless black steel with welded joints. Vent conduit to the outside and terminate with a screened vent cap.
 - 1. Above-Ceiling Locations: Gas piping may be installed in accessible above-ceiling spaces (subject to approval of the authority having jurisdiction), whether or not such spaces are used as a plenum. Do not locate valves in such spaces.
 - 2. In Floors: Gas piping with welded joints and protective wrapping may be installed in floors, subject to approval of authority having jurisdiction. Surround piping cast in concrete slabs with a minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
 - 3. In Floor Channels: Gas piping may be installed in floor channels (subject to approval of authority having jurisdiction). Channels must have cover and be open to space above cover for ventilation.
 - 4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing against physical damage when it is installed inside partitions or hollow walls. This does not apply to tubing passing through partitions or walls.
 - 5. In Walls: Gas piping with welded joints and protective wrapping may be installed in the masonry walls (subject to approval of authority having jurisdiction).
 - 6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash shuts, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts. This does not apply to accessible above-ceiling space specified above.
- L. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of gas meters. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- M. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, except where indicated to be exposed to view.
- N. Install gas piping at a uniform grade of 1/4 inch in 15 feet, upward toward risers. Install piping upward from service risers to meters, service regulator when meter is not provided, and equipment.
- O. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- P. Connect branch piping from top or side of horizontal piping.
- Q. Install unions in pipes 2 inches and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- R. Install dielectric fittings (unions and flanges) with 1 ferrous and 1 brass or bronze-end connections, separated by insulating material, where piping of dissimilar metals are joined.
- S. Install dielectric fittings (unions and flanges) with 2 ferrous end connections, separated by insulating material, at outlet from gas meter and, where indicated, for ferrous piping.
- T. Install flanges on valves, specialties, and equipment having 2-1/2 inch and larger connections.

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SECTION 231123 - FACILITY NATURAL GAS PIPING

- U. Install strainers on the supply side of each control valve, gas pressure regulator, solenoid valve, and elsewhere as indicated.
- V. Anchor piping to ensure proper direction of piping expansion and contraction. Install expansion joints, expansion loops, and pipe guides as indicated.
- W. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing elbow fittings with corrosion-resistant insect screens in large end.
- X. Install containment conduits for buried gas piping within building in gas-tight conduits extending 4 inches minimum outside building and vented to atmosphere. Terminate vents with turned-down, reducing elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal tar epoxy-polyamide paint according to SSPC Paint 16.
- Y. Refer to Division 22 for hanger and support devices.
- Z. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

Nominal Pipe Size (Inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Diameter (Inches)
3/8	---	4	3/8
1/2	6	6	3/8
5/8	---	6	3/8
3/4	8	7	3/8
7/8	---	7	3/8
1	8	8	3/8
1-1/4	9	9	3/8
1-1/2 to 2	10	10	3/8
2-1/2 to 3-1/2	10	10	1/2
4	---	10	1/2
4 and Larger	10	---	5/8

- 1. Support vertical pipe at each floor.
- AA. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached with a metal chain indicated the piping systems supplied.
- BB. Install a gas valve upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.
- CC. Install pressure-relief or pressure-limiting devices so they can be readily operated to determine if valve is free; test to determine pressure at which they will operate; and examine for leakage when in closed position.
- DD. Install gas piping next to gas-utilizing equipment and appliances to allow servicing and maintenance.
- EE. Connect gas piping to gas-utilizing equipment and appliances with shutoff valves and unions. Make connections downstream of valves and unions, with flexible connectors where indicated.
- FF. Electrical Connections: Wiring is specified in Division 16.
- GG. I
Install a gas valve upstream and within 6 feet of each gas-utilizing appliance. Install a union or flanged connection downstream from the valve to permit removal of controls.
- HH. Sediment Traps: Install tee fittings forming drips, as close as practical to gas appliance inlets. Cap or plug bottom outlet.
- II. Install aboveground portions of natural gas piping systems that are upstream from equipment shutoff valves, electrically continuous and bonded to a grounding electrode according to NFPA 70.
- JJ. Do not use gas piping as a grounding electrode.

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SECTION 231123 - FACILITY NATURAL GAS PIPING

KK. Inspect, test, and purge natural gas systems according to NFPA 54, Part 4 "Gas Piping Inspection, Testing and Purging" and local gas utility requirements.

1. Repair leaks and defects with new materials, and retest system until satisfactory results are obtained.
2. Report test results promptly and in writing to the Architect and the authority having jurisdiction.

END OF SECTION

CHASE
SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, material and equipment called for in these Specifications and accompanying Drawings and shall install the system complete in every respect. Work shall include but not be limited to the following:
 - 1. Pipes, tubing, fittings and specialties.
 - 2. Special duty valves.
 - 3. Refrigerants.

1.3 SUBMITTALS

- A. Product data for the following products:
 - 1. Each type valve specified.
 - 2. Each type refrigerant piping specialty specified.
- B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximate to equipment.

1.4 QUALITY ASSURANCE

- A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications".
- B. Regulatory Requirements: Comply with provisions of the following codes:
 - 1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping.
 - 2. ANSI/ASHRAE Standard 15: Safety Code for Mechanical Refrigeration.
 - 3. BOCA Basic National Mechanical Code.

PART 2 - PRODUCTS

2.1 TUBING AND FITTING

- A. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.
- B. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.

2.2 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (Silver).

2.3 VALVES

- A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.
- B. Globe: 450 psig maximum operating pressure, 275 deg. F maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.
- C. Check Valves - Smaller Than 7/8 inch: 500 psig maximum operating pressure, 300 deg. F maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel

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spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.

- D. Solenoid Valves: 250 deg. F temperature rating, 400 psig working pressure; forged brass, with Teflon valve seat, two-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2-inch conduit adapter, and 24 volt, 60 Hz. normally closed holding coil.
- E. Evaporator Pressure Regulating Valves: pilot-operated, forged brass or cast bronze; complete with pilot operator, stainless steel bottom spring, pressure gage tapings, 24 volts DC, 50/60 Hz, standard coil; and wrought copper fittings for solder end connections.
- F. Thermal Expansion Valves: thermostatic adjustable, modulating type; size as required for specific evaporator requirements, and factory set for proper evaporator superheat requirements. Valves shall have copper fittings for solder end connections; complete with sensing bulb, a distributor having a side connection for hot gas bypass line, and an external equalizer line.
- G. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.

2.4 REFRIGERANT PIPING SPECIALTIES

- A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.
- B. Strainers: 500 psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.
- C. Moisture/liquid Indicators: 500 psig maximum operation pressure, 200 deg. F maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.
- D. Filter-driers: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets, as follows:
 - 1. Standard capacity desiccant sieves to provide micron filtration.
 - 2. High capacity desiccant sieves to provide micron filtration and extra drying capacity.
- E. Suction Line Filter-Drier: 350 psig maximum operation pressure, 225 deg. F maximum operating temperature; steel shell, and wrought copper fittings for solder end connections. Permanent filter element shall be molded felt core surrounded by a desiccant. For removal of acids and moisture for refrigerant vapor.
- F. Suction Line Filters: 500 psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter core kit, including gaskets.
- G. Flexible Connectors: 500 psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inch in length.

2.5 REFRIGERANT

- A. Refrigerant No. 22, in accordance with ASHRAE Standard 34.

2.6 PIPE APPLICATIONS

- A. Use Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Use Type K, annealed temper copper tubing for 2 inch and smaller without joints, below ground and within slabs. Mechanical fittings (crimp or flair) are not permitted.

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PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

- A. General: Install refrigerant piping in accordance with ASHRAE Standard 15 - "The Safety Code for Mechanical Refrigeration."
- B. Install piping in as short and direct arrangement as possible to minimize pressure drop.
- C. Install piping for minimum number of joints using as few elbows and other fitting as possible.
- D. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.
- E. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.
- F. Insulate suction lines. Liquid lines are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.
 - 1. Do not install insulation until system testing has been completed and all leaks have been eliminated.
- G. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.
- H. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
- I. Slope refrigerant piping as follows:
 - 1. Install horizontal hot gas discharge piping with 1/2" per 10 feet downward slope away from the compressor.
 - 2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
 - 3. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
 - 4. Liquid lines may be install level.
- J. Use fittings for all changes in direction and all branch connections.
- K. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- L. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- M. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- N. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- O. Locate groups of piper parallel to each other, spaced to permit applying insulation and servicing of valves.
- P. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inch and larger shall be sheet metal.
- Q. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.
- R. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- S. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.

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- T. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.
 - 1. Install moisture/liquid indicators in lines larger than 2-1/8 inch OD, using a bypass line.
- U. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.
- V. Install flexible connectors at the inlet and discharge connection of compressors.

3.2 HANGERS AND SUPPORTS

- A. General: Hanger, supports, and anchors are specified in Division 15 Section "SUPPORTS AND ANCHORS." Conform to the table below for maximum spacing of supports:
- B. Install the following pipe attachments:
- C. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.
- D. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
- E. Pipe rollers complete supports for multiple horizontal runs, 20 feet or longer supported by a trapeze.
- F. Spring hangers to support vertical runs.
- G. Install hangers with the following minimum rod sizes and maximum spacing:

<u>Nom. Pipe Size</u>	<u>Max. Span-Ft.</u>	<u>Min. Rod Size Inches</u>
1	7	3/8
1-1/2	9	3/8
2	10	3/8
3	12	1/2
3-1/2	13	1/2
4	14	5/8
5	16	5/8
6	17	3/4
8	19	7/8
10	22	7/8
12	23	7/8

- H. Support vertical runs at each floor.

3.3 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
 - 1. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
 - 2. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.
- B. Fill the pipe and fittings during brazing, with an inert gas (ie., nitrogen or carbon dioxide) to prevent formation of scale.
- C. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

3.4 VALVE INSTALLATIONS

- A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions.
- B. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators, and elsewhere as indicated.
- C. Install a full sized, 3-valve bypass around each drier.

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- D. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
 - 1. Electrical wiring for solenoid valves is specified in Division 16. Coordinate electrical requirements and connections.
- E. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
 - 1. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
 - 2. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
 - 3. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
 - 4. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.
- F. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

3.5 EQUIPMENT CONNECTIONS

- A. The Drawings indicate the general arrangement of piping, fittings, and specialties.
Install piping adjacent to machine to allow servicing and maintenance.

3.6 FIELD QUALITY CONTROL

- A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.
- B. Repair leaking joints using new materials, and retest for leaks.

3.7 COMMISSIONING

- A. Charge system using the following procedure:
 - 1. Install core in filter dryer after leak test but before evacuation.
 - 2. Evacuate refrigerant system with vacuum pump; until temperature of 35 deg F is indicated on vacuum dehydration indicator.
 - 3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
 - 4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
 - 5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
 - 6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

END OF SECTION

CHASE
SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general Provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. This Contractor shall furnish all labor, material, equipment and services required to execute, install and complete, ready for use, all plumbing work including sanitary and water systems for the project, according to the drawings and these specifications.

1.3 SUBMITTALS

- A. Submit product data on duct liner, sealing materials, and fire-stopping materials.

1.4 COMPLIANCE

- A. Comply with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS, GENERAL

- A. Provide the following materials where indicated. Package and mark sheet metal materials as specified in ASTM A 700.
- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A527, Coating Designation G90, mill phosphatized finish for exposed surfaces of ducts exposed to view.

2.2 REINFORCEMENT SHAPES AND PLATES

- A. Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts.

2.3 TIE RODS

- A. Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 JOINT AND SEAM TAPE

- A. 2 inches wide, glass-fiber-fabric reinforced.

2.5 TAPE SEALING SYSTEM

- A. Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with the tape to form a hard, durable, airtight seal.

2.6 JOINT AND SEAM SEALANT

- A. One-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.

2.7 FLANGED JOINT MASTICS

- A. One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

2.8 FIRE-STOPPING

- A. Refer to Division 7 Section "Joint Sealers."

2.9 FIRE-RESISTANT SEALANT

- A. Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors,

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having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

2.10 FIRE-RESISTANT SEALANT

- A. Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
 - 2. "Pensil 851"; General Electric Co.
 - 3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 - 4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 - 5. "RTV 7403"; General Electric Co.
 - 6. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.11 HANGERS AND SUPPORTS

- A. Provide the following hanger and support components as indicated.
- B. Building Attachments:
 - 1. Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials.
 - 2. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.
- C. Hangers:
 - 1. Galvanized sheet steel, or round, uncoated steel, threaded rod.
 - 2. Hangers Installed In Corrosive Atmospheres:
 - a. Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.
 - 3. Straps and Rod Sizes:
 - a. Conform to Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.
- D. Duct Attachments:
 - 1. Sheet metal screws, blind rivets, or self-tapping metal screws, compatible with duct materials.

2.12 TRAPEZE AND RISER SUPPORTS

- A. Steel shapes conforming to ASTM A36.
- B. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
- C. For stainless steel ducts, provide stainless steel support materials.
- D. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.13 RECTANGULAR DUCT FABRICATION

- A. Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details.
- B. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
- C. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
- D. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

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2.14 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1985 Edition, Figures 2-1 through 2-10.

2.15 ROUND AND FLAT OVAL DUCT FABRICATION

- A. "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.
- B. Round Ducts:
 - 1. Fabricate round supply ducts with spiral lockseam construction, except where diameters exceed 72 inches.
 - 2. Fabricate ducts having diameters greater than 72 inches with longitudinal butt-welded seams.
 - 3. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- C. Round Ducts:
 - 1. Fabricate round supply ducts using seam types identified in SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figure 3-1, RL-1, RL-4, or RL-5.
 - 2. Seams Types RL-2 or RL-3 may be used if spot-welded on 1-inch intervals.
 - 3. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- D. Flat Oval Ducts:
 - 1. Fabricate flat oval supply ducts with standard spiral lock seams (without intermediate ribs) or with butt-welded longitudinal seams in gages listed in SMACNA "HVAC Duct Construction Standards," Table 3-4.
- E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figures 3-4 and 3-5 and with metal thickness specified for longitudinal seam straight duct.
- F. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- G. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter.
 - 1. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.
 - 2. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.
 - 3. Round Elbows - Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.
 - 4. Die-Formed Elbows for Sizes Through 8 Inches and All Pressures: 20 gage with 2-piece welded construction.
 - 5. Round Gored Elbows Gages: Same as for non-elbow fittings specified above.
 - 6. Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.
 - 7. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches: 26 gage.

PART 3 - EXECUTION

3.1 DUCT SYSTEM PRESSURE CLASS

- A. Construct and install each duct system for the specific duct pressure classification indicated.

3.2 INSTALLATION

- A. Install ducts with the fewest possible joints.
- B. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

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- C. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- D. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- E. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- F. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
- G. Install insulated ducts with 1-inch clearance outside of insulation.
- H. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- I. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

3.3 ELECTRICAL EQUIPMENT SPACES

- A. Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

3.4 NON-FIRE-RATED PARTITION PENETRATIONS

- A. Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct.
- B. Overlap opening on 4 sides by at least 1-1/2 inches.

3.5 SEAM AND JOINT SEALING

- A. Seal duct seams and joints as indicated in this specification.
- B. Pressure Classifications Greater Than 3 Inches Water Gage:
 - 1. All transverse joints, longitudinal seams, and duct penetrations.
- C. Pressure Classification 2 and 3 Inches Water Gage:
 - 1. All transverse joints and longitudinal seams.
- D. Pressure Classification Less than 2 Inches Water Gage:
 - 1. Transverse joints only.
- E. Seal externally insulated ducts prior to insulation installation.

3.6 HANGING AND SUPPORTING

- A. Install and support ducts as follows unless indicated otherwise:
- B. Rigid Round, Rectangular, and Flat Oval: As indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- C. Horizontal Ducts: Within 2 feet of each elbow and within 4 feet of each branch intersection.
- D. Vertical Ducts: At a maximum interval of 16 feet and at each floor.
- E. Upper Attachments To Structures: Allow for a load not exceeding 1/4 of the failure (proof test) load, but are not limited to the specific methods indicated.
- F. Install concrete insert prior to placing concrete.
- G. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.7 CONNECTIONS

- A. Make duct connections as specified below unless indicated otherwise:

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- B. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 15 Section "Duct Accessories."
- C. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.
- D. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.
- E. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figure 2-19.

3.8 ADJUSTMENTS AND CLEAN-UP

- A. Adjust volume control devices as required by the testing and balancing procedures to achieve required airflow.
- B. Refer to Division 15 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.
- C. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION

CHASE
SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. This Contractor shall furnish all labor, material, equipment and services required to execute, install and complete, ready for use, all work for the project, according to the drawings and these specifications.

1.3 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for backdraft dampers, manual volume control dampers, fire and smoke dampers, duct-mounted access panels and doors, and flexible ducts and connectors.
 - 2. Shop drawings for special fittings and volume control damper installations and fire and smoke damper installations, including sleeves and duct-mounted access door and panel installations.

1.4 QUALITY ASSURANCE

- A. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- B. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

- A. Suitable for horizontal or vertical installation.
- B. Frame: 18-gage galvanized steel, with welded corners.
- C. Frame: 0.063-inch-thick 6063T extruded aluminum.
- D. Blades: 0.025-inch-thick roll-formed aluminum.
- E. Blades: 0.050-inch-thick 6063T extruded aluminum.
- F. Blade Seals: Felt.
- G. Blade Seals: Vinyl.
- H. Blade Seals: Neoprene.
- I. Blade Axles: Nonferrous.
- J. Blade Axles: Galvanized steel.
- K. Tie Bars and Brackets: Aluminum.
- L. Tie Bars and Brackets: Galvanized steel.
- M. Return Spring: Adjustable tension.
- N. Chain Operator: 15-foot-long galvanized-steel sash chain and pulley.
- O. Wing-Nut Operator: Galvanized steel, with 1/4-inch galvanized-steel rod.

2.2 MANUAL VOLUME CONTROL DAMPERS

- A. Factory-fabricated multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, and suitable for horizontal or vertical applications. Stiffen damper blades to provide stability under operating conditions. Provide locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class. Provide end bearings or other seals for ducts with pressure classifications of 3 inches or higher. Extend axles full length of damper blades. Provide bearings at both ends of operating shaft.

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- B. Steel Frames: Hat-shaped, galvanized-steel channels, minimum of 16 gauges, and with mitered and welded corners. Provide frames with flanges where indicated for attaching to walls. Provide flangeless frames where indicated for installation in ducts.
- C. Roll-Formed Steel Blades: 16-gage galvanized steel.
- D. Blade Axles: Galvanized steel.
- E. Tie Bars and Brackets: Galvanized steel.

2.3 DAMPER CONTROL HARDWARE

- A. Zinc-plated, die-cast core with a heavy-gage dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Provide center hole to suit damper operating rod size. Provide elevated platform for insulated duct mounting.

2.4 ACTUATORS

- A. Provide motors for smooth modulating or 2-position action.
- B. Permanent-Split-Capacitor or Shaded-Pole Motors: Provide with oil-immersed and sealed gear trains.
- C. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 inch-pounds and breakaway torque rating of 150 inch-pounds.
- D. Outdoor Motors and Motors in Outside Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
- E. 2-Position Motor: 115 V, single phase, 60 Hz.
- F. 2-Position Motor: 230 V, single phase, 60 Hz.
- G. 2-Position Motor: 230 V, 3 phase, 60 Hz.
- H. Turning Vanes: Fabricate turning vanes according to SMACNA HVAC Duct Construction Standards, Figures 2-2 through 2-7.
- I. Manufactured Turning Vanes: Fabricate of 1-1/2-inch-wide, curved blades set at 3/4 inch on center, support with bars perpendicular to blades set at 2 inches on center, and set into side strips suitable for mounting in ducts.
- J. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fiberglass fill.

2.5 FLEXIBLE CONNECTORS

- A. Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL Standard 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-gage aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 1st Edition, Figure 2-19.
- C. Conventional, Indoor System Flexible Connectors Fabric: Glass fabric double coated with polychloroprene.
 - 1. Minimum Weight: 26 oz. per sq yd.
 - 2. Tensile Strength: 480 lb per inch in the warp and 360 lb per inch in the filling.
- D. Conventional, Outdoor System Flexible Connectors Fabric: Glass fabric double coated with DuPont's HYPALON or other synthetic-rubber weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
 - 1. Minimum Weight: 26 oz. per sq yd.
 - 2. Tensile Strength: 530 lb per inch in the warp and 440 lb per inch in the filling.

CHASE
SECTION 233300 – AIR DUCT ACCESSORIES

3. High-Temperature System Flexible Connectors: Glass fabric coated with silicone rubber and having a minimum weight of 16 oz. per sq yd and tensile strength of 285 lb per inch in the warp, and 185 lb per inch in the filling.
4. High-Corrosive-Environment System Flexible Connectors: Glass fabric coated with a chemical-resistant coating.
5. Minimum Weight: 14 oz. per sq yd.
6. Tensile Strength: 450 lb per inch in the warp and 340 lb per inch in the filling.

2.6 FLEXIBLE DUCTS

- A. Comply with UL 181, Class 1.
- B. Flexible Ducts - Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.
- C. Flexible Ducts - Uninsulated: Corrugated aluminum.
- D. Flexible Ducts - Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch-thick, glass fiber insulation around a continuous inner liner.
 1. Reinforcement: Steel-wire helix encapsulated in the inner liner.
 2. Outer Jacket: Glass-reinforced, silver mylar with a continuous hanging tab, integral fiber glass tape, and nylon hanging cord.
 3. Outer Jacket: Polyethylene film.
 4. Inner Liner: Polyethylene film.

2.7 INSTRUMENT TEST HOLES

- A. Cast iron or cast aluminum to suit duct material, including screw cap and gasket and a flat mounting gasket. Size to allow insertion of pivot tube and other testing instruments and provide in length to suit duct insulation thickness.

2.8 SPLITTER DAMPER ACCESSORIES

- A. Zinc-plated damper blade bracket; 1/4-inch; zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

2.9 FLEXIBLE DUCT CLAMPS

- A. Stainless steel band with cadmium-plated hex screw to tighten band with a worm-gear action. Provide in sizes from 3 to 18 inches to suit duct size.

2.10 ADHESIVES

- A. High strength, quick setting, neoprene based, waterproof and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.
- B. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

END OF SECTION

CHASE
SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. This Contractor shall furnish all labor, material, equipment and services required to execute, install and complete, ready to use, all work for the project, according to the drawings and these specifications.

1.3 SUBMITTALS

- A. Submit the following:
 - 1. Product data for selected models, including certified fan performance curves certified fan sound power ratings, motor ratings and electrical characteristics, materials gages and finishes, including color charts, and dampers, including housings, linkages, and operators.
 - 2. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.
 - 3. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field-installed wiring.
 - 4. Maintenance data for air-handling units, for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 15 Section "Basic Mechanical Requirements."

1.4 STANDARDS AND COMPLIANCES

- A. UL Compliance: Fans and components shall be UL listed and labeled.
- B. Nationally Recognized Testing Laboratory and NEMA Compliance (NRTL): Fans and components shall be NRTL listed and labeled. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.1 TESTING REQUIREMENTS

- A. Sound Power Level Rating:
 - 1. Comply with AMCA Standard 301 "Method for Calculating Fan Sound Ratings From Laboratory Test Data."
 - 2. Test fans in accordance with AMCA Standard 300 "Test Code for Sound Rating."
 - 3. Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.
- B. Fan Performance Ratings:
 - 1. Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51 - Laboratory Methods of Testing Fans for Rating.

2.2 FANS, GENERAL

- A. Provide fans that are factory fabricated and assembled, factory tested, and factory finished with indicated capacities and characteristics.
- B. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.
 - 1. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan's class.
- C. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

CHASE
SECTION 233423 - HVAC POWER VENTILATORS

1. Service Factor: 1.4.
- D. Belts: Oil-resistant, non-sparking, and non-static.
- E. Motors and Fan Wheel Pulleys: Adjustable pitch for use with motors through 15 HP; fixed pitch for use with motors larger than 15 HP. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
 1. Belt Guards: Provide steel belt guards for motors mounted on the outside of the fan cabinet.
- F. Shaft Bearings: Provide type indicated, having a median life "Rating Life" (AFBMA L(50)) of 200,000, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.
- G. Factory Finish: The following finishes are required:
 1. Sheet Metal Parts: Prime coating prior to final assembly.
 2. Exterior Surfaces: Baked-enamel finish coat after assembly.

2.3 CENTRIFUGAL ROOF VENTILATORS

- A. Belt-driven or direct-drive as indicated, centrifugal consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; square, one-piece, hinged aluminum base with venturi inlet cone.
- C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.
- D. Belt-Driven Drive Assembly: Resiliently mounted to the housing, with the following features:
 1. Pulleys: Cast-iron, adjustable-pitch.
 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 3. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.
 4. Fan and motor isolated from exhaust air stream.
- E. Accessories: The following items are required as indicated:
 1. Disconnect Switch: Non-fusible type, with thermal overload protection mounted inside fan housing, factory-wired through an internal aluminum conduit.
 2. Bird Screens: Removable 1/2-inch mesh, 16-gage, aluminum or brass wire.
 3. Dampers: Counterbalanced, parallel-blade, back-draft dampers mounted in curb base, factory set to close when fan stops.
 4. Dampers: Motor-operated, parallel-blade, volume control dampers mounted in curb base.
 - a. Blades: Die-formed sheet aluminum.
 - b. Frame: Extruded aluminum, with waterproof, felt blade seals.
 - c. Linkage: Nonferrous metals, connecting blades to counter weight or operator.
 - d. Operators: Manufacturer's standard electric motor.
 - e. Operators: Manufacturer's standard pneumatic motor.
 5. Roof Curbs: Prefabricated, heavy-gage, galvanized steel; mitered and welded corners; 2-inch-thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for flat roof decks; and 2-inch wood nailer. Size as required to suit roof opening and fan base.
 - a. Overall Height: 12 inches.

2.4 CEILING-MOUNTED VENTILATORS

- A. Centrifugal fan designed for installation in ceiling, wall, or concealed inline applications.
- B. Housing: Galvanized steel lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Stainless steel, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories: Manufacturer's standard roof jack, wall cap, and transition fittings as indicated.

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SECTION 233423 - HVAC POWER VENTILATORS

2.5 MOTORS

- A. Sufficient to accelerate the driven loads satisfactorily. Minimum sizes and electrical characteristics as indicated. If not indicated, large enough so that the driven load will not require the motor to operate in the service factor range.
- B. Temperature Rating: 50 deg C maximum temperature rise at 40 deg C ambient for continuous duty at full load (Class A Insulation).
- C. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.
- D. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design B. Provide permanent-split capacitor classification motors for shaft-mounted fans and capacitor start classification for belted fans.
 - 1. Bases: Adjustable.
 - 2. Bearings: The following features are required:
 - a. Ball or roller bearings with inner and outer shaft seals.
 - b. Grease lubricated.
 - c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
 - 3. Enclosure Type: The following features are required:
 - a. Open drip-proof motors where satisfactorily housed or remotely located during operation.
 - b. Guarded drip-proof motors where exposed to contact by employees or building occupants.
 - 4. Overload protection: Built-in, automatic reset, thermal overload protection.
 - 5. Noise rating: Quiet.
 - 6. Efficiency: Energy-efficient motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, Test Method B. If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors" in accordance with IEEE Standard 112, Test Method B.
 - 7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.
- E. Starters, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fans level and plumb, in accordance with manufacturer's written instructions. Support units as described below, using the vibration control devices indicated. Vibration control devices are specified in Division 15 Section "Vibration Controls."
- B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
 - 1. Installation of roof curbs is specified in Division 7.
- C. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.
- D. Arrange installation of units to provide access space around air- handling units for service and maintenance.
- E. Duct installations and connections are specified in other Division 23 sections. Make final duct connections with flexible connections.

3.2 ELECTRICAL CONNECTIONS

- A. Electrical power wiring is specified in Division 26.
- B. Temperature control wiring and interlock wiring are specified in Section 230900
- C. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.3 FIELD QUALITY CONTROL

- A. Arrange and pay for a factory-authorized service representative to perform the following:

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SECTION 233423 - HVAC POWER VENTILATORS

- B. Inspect the field assembly of components and installation of fans including ductwork and electrical connections.
- C. Prepare a written report on findings and recommended corrective actions.

3.4 ADJUSTING, CLEANING, AND PROTECTING

- A. Adjust damper linkages for proper damper operation. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

END OF SECTION

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to Work of this Section.

1.2 WORK INCLUDED

- A. The Contractor shall furnish all labor, material and equipment called for in these Specifications and accompanying Drawings and shall install the system complete in every respect. All purchases equipment to comply with local system complete in every respect.

1.3 COMPLIANCE

- A. ADC Compliance: Test and rate registers, grilles, and diffusers in accordance with ADC Equipment Test Code 1062, provide Certified Ratings Seal on each unit.
- B. ARI Compliance: Test and rate registers, grilles, and diffusers in accordance with ARI Standard 650.
- C. AMCA Compliance: Test and rate louvers, dampers, and shutters in accordance with AMCA Standard 500, provide Certified Ratings Seal on each unit.
- D. NFPA Compliance: Construct and install air outlets and inlets in accordance with NFPA 90A, and 90B.

1.4 SUBMITTALS

- A. Submit manufacturer's technical product data, assembly-type shop drawings, and maintenance data.

PART 2 - PRODUCT**2.1 CEILING AIR DIFFUSERS**

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of ceiling air diffuser.
- D. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as specified. The following requirements shall apply to nomenclature indicated on schedule:
 - 1. Diffuser Faces:
 - a. Square (SQ): Square housing, core of square concentric louvers, square or round duct connection.
 - b. Rectangular (RCT): Rectangular housing, core of rectangular concentric louvers, square or round duct connection.
 - c. Linear (LR): Extruded aluminum continuous slot, single or multiple.
 - 2. Diffuser Mountings:
 - a. Stepped-Down (S-D): Diffuser housing below ceiling with perimeter flange and gasket to seal against ceiling construction.
 - b. Flush (FL): Diffuser housing above ceiling surface with flush perimeter flange and gasket to seal against ceiling.
 - c. Lay-In (L-I): Diffuser housing sized to fit between ceiling exposed suspension tee bars and rest on top surface of tee bar.
 - d. Snap-In (S-I): Diffuser housing sized to fit between ceiling concealed suspension runners, and snap into runners.

SECTION 233713 – DIFFUSERS, REGISTER, AND GRILLES

3. Diffuser Patterns:
 - a. Fixed (FX): Fixed position core with concentric rings or louvers for radial air flow around entire perimeter of diffuser.
 - b. 2 Position (2-P): Manual 2 position core with concentric rings or louvers, upper position for horizontal air flow, lower position for vertical air flow.
 - c. Adjustable (ADJ): Manual adjustable core with concentric rings or louvers, fully adjustable for horizontal to vertical air flow.
 - d. 1 Way (1-Way): Fixed louver face for 1 direction air flow, direction indicated on drawings.
 - e. 2 Way (2-W): Fixed louver face for 2 direction air flow, directions indicated on drawings.
 - f. 3 Way (3-W): Fixed louver face for 3 direction air flow, directions indicated on drawings.
 - g. 4 Way (4-W): Fixed louver face for 4 direction air flow, directions indicated on drawings.
 - h. Rearrangeable Core (R-C): Modular directional core which can be rearranged for selected air pattern.
4. Diffuser Dampers:
 - a. Opposed Blade (O-B): Adjustable opposed blade damper assembly, key operated from face of diffuser.
 - b. Supply and Return (S & R): For supply and return diffusers, butterfly type damper in return neck, annular adjustable dampers in supply duct.
 - c. Integral (ITGL): Combination volume control and pattern adjustment for linear diffusers.
 - d. Fire Damper (F-D): Combination adjustable opposed blade damper and fusible link fire damper with UL approved link and assembly designed to meet requirements of NFPA 90A.
5. Diffuser Accessories:
 - a. Equalizing Deflectors (E-D): Adjustable parallel blades in frame for straightening air flow.
 - b. Smudge Ring (S-R): Extension perimeter frame around diffuser, sized so induced air impinges on frame and not on ceiling.
 - c. Plaster Ring (P-R): Perimeter ring designed to act as plaster stop and diffuser anchor.
 - d. Extractor (EXTR): Curved blades mounted on adjustable frame to produce air scooping action in duct at diffuser take-off.
 - e. Blank-off Baffles (B-O-B): Arc segments designed to fit into diffuser housing to divert air flow from impinging on obstruction.
 - f. Operating Keys (OP-KY): Tools designed to fit through diffuser face and operate volume control device and/or pattern adjustment.
6. Diffuser Finishes:
 - a. Aluminum Enamel (A-E): Air-dried aluminum enamel prime finish.
 - b. White Enamel (W-E): Semi-gloss white enamel prime finish.
 - c. Aluminum Anodize (A-A): Aluminum etched and anodized, covered with clear lacquer finish.

E. Manufacturers: Carnes; Titus; or Tuttle & Bailey.

2.2 WALL REGISTERS AND GRILLES

- A. General: Except as otherwise indicated, provide manufacturer's standard wall registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide wall registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Wall Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction that will contain each type of wall register and grille.

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SECTION 233713 – DIFFUSERS, REGISTER, AND GRILLES

- D. Types: Provide wall registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule. The following requirements shall apply to nomenclature indicated on schedule.
1. Register and Grille Materials:
 - a. Steel Construction (ST): Manufacturer's standard stamped sheet steel frame and adjustable blades.
 - b. Aluminum Construction (AL): Manufacturer's standard extruded aluminum frame and adjustable blades.
 2. Register and Grille Faces:
 - a. Horizontal Straight Blades (H-S): Horizontal blades, individually adjustable, at manufacturer's standard spacing.
 - b. Vertical Straight Blades (V-S): Vertical blades, individually adjustable, at manufacturer's standard spacing.
 - c. Horizontal 45 Degree Fixed Blades (H-45 Degrees): Horizontal blades, 45 degrees fixed, at manufacturer's standard spacing.
 3. Register and Grille Patterns:
 - a. Single Deflection (S-D): 1-set of blades in face.
 - b. Double Deflection (D-D): 2-sets of blades in face, rear set at 90 degrees to face set.
 4. Register and Grille Dampers:
 - a. Opposed Blade (O-B): Adjustable opposed blade damper assembly, key operated from face of register.
 - b. Opposed Blade Fusible Link (OBFL): Opposed blade damper with spring closing and UL-listed fusible link for 160 degrees F (71 degrees C).
 5. Register and Grille Accessories:
 - a. Extractor (EXTR): Curved blades mounted on adjustable frame to produce air scooping action in duct at register or grille take-off.
 - b. Plaster Frame (P-F): Perimeter frame designed to act as plaster stop and register or grille anchor.
 - c. Operating Keys (OP-KY): Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustment.
 6. Register and Grille Finishes:
 - a. Aluminum Enamel (A-E): Air-dried aluminum enamel prime finish.
 - b. White Enamel (W-E): Semi-gloss white enamel prime finish.
 - c. Aluminum Anodize (A-A): Aluminum etched and anodized, covered with clear lacquer finish.
- E. Manufacturers: Carnes; Titus; or Tuttle & Bailey.

2.3 LOUVERS

- A. General: Except as otherwise indicated, General Contractor shall provide louvers where shown; of size, shape, capacity constructed of materials and components as indicated on Architectural Drawings and Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans" and "Interior Elevations". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

END OF SECTION

CHASE
SECTION 236400 - CONDENSING UNITS

PART 1 - GENERAL

1.1 RELATED SECTIONS

1.2 SUBMITTALS

- A. Submit manufacturer's technical product data, installation and start-up instructions, wiring diagrams, and maintenance data, in accordance with requirements of Division 1.

1.3 QUALITY ASSURANCE

- A. Capacity ratings for condensing units shall be in accordance with ARI Standard 360 "Standard for Commercial and Industrial Unitary Air-Conditioning Equipment".
- B. Refrigeration system of condensing units shall be in accordance with ASHRAE Standard ASHRAE 15 "Safety Code for Mechanical Refrigeration".
- C. Condensing units shall meet or exceed the minimum COP/Efficiency levels as prescribed in ASHRAE 90A "Energy Conservation in New Building Design".
- D. Condensing units shall be listed by UL and have UL label affixed.

1.4 WARRANTY

- A. Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, motors/compressors with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
- B. Warranty Period: 5 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 AIR-COOLED CONDENSING UNITS

- A. Factory-assembled and tested, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls. Capacities and electrical characteristics shall be as scheduled.

2.2 UNIT CASINGS

- A. Designed for outdoor installation with weather protection for components and controls. Casings shall have removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features:
- B. Galvanized or zinc-coated steel for exposed casing surfaces, treated and finished with manufacturer's standard paint coating.
- C. Units shall have lifting lugs to facilitate rigging of units.
- D. Metal grilles, factory-installed, for protection of condenser coil during shipping, installation, and operation.
- E. Control panel door, hinged and gasketed.

2.3 COMPRESSOR

- A. Reciprocating hermetic-type compressor, 1,750 RPM, designed for air-cooled condensing with compressor lubrication, crankcase sight glass and crankcase heater; back-seating service access valves on suction and discharge ports. Capacity control shall be through cylinder unloading.
- B. Crankcase heater in well within crankcase.
- C. Capacity steps as scheduled, or greater number.

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SECTION 236400 - CONDENSING UNITS

- D. Compressor of same manufacturer as condensing unit.

2.4 CONTROLS

- A. Provide operating and safety controls shall include high and low pressure cutouts, oil pressure cutout, compressor winding thermostat cutout. Provide 3-leg compressor overload protection. Protect condenser fan motors with thermal and overload cutouts. Provide control transformer if required for 115-volts control power. Provide magnetic contactors for compressor and condenser fan motors.

Additional features:

1. Reset relay circuit for manual resetting of cutouts from remote thermostat location.
 2. Automatic non-recycling pump-down, and timing device to prevent excessive compressor cycling.
 3. Un-fused disconnect switch, factory-mounted and wired, for single external electrical power connection.
- B. Coordinate with project electrician to provide BMS controls and sensors as indicated in the project drawings.

2.5 CONDENSING SECTION

- A. Seamless copper tubing mechanically bonded to heavy-duty, configured aluminum fins with separate and independent refrigeration circuit for each compressor, liquid accumulator and sub-cooling circuit, and back-seating liquid line service access valve. Factory-test condenser coils at 450 psig and vacuum dehydrate.

2.6 CONDENSER FANS AND DRIVES

- A. Propeller-type condenser fans for vertical air discharge; either direct drive or belt drive fans and motors. Include:
 1. Permanent lubricated ball bearing condenser fan motors.
 2. Separate motor for each condenser fan.
 3. Constant speed condenser fan motors.

2.7 LOW AMBIENT CONTROL

- A. Low ambient damper assembly, fan speed control, or fan cycling control; factory-installed.

2.8 MANUFACTURERS

- A. Subject to compliance with requirements, provide air-cooled condensing units of the following: Carrier Air Conditioning

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install condensing units in accordance with manufacturers installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Install BMS controls and sensors as indicated in the project drawings. Refer to Section 260943.

3.2 SUPPORT

- A. Install ground-mounted units on 4" thick reinforced concrete pad, 4" larger on each side than condensing unit. Anchor unit to pad using inserts or anchor bolts. Install roof-mounted units on mechanical equipment stand, constructed in accordance with NRCA Handbook. Anchor unit to structural frame with removable fasteners.

3.3 ELECTRICAL WIRING

- A. Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

CHASE

SECTION 236400 - CONDENSING UNITS

- B. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.

3.4 AIR-COOLED CONDENSING UNITS

- A. Connect refrigerant piping to unit; run piping so as not to interfere with access to unit.
- B. Install furnished field-mounted accessories.

3.5 TESTING

- A. Charge systems with refrigerant and oil, and test for leaks. Repair leaks and, place lost refrigerant and oil.
- B. Start-up condensing units, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative.
- C. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

3.6 TRAINING

- A. Provide services of manufacturer's technical representative to instruct Owner's personnel in operation and maintenance of condensing units.

END OF SECTION

PART 1 - GENERAL

1.1 STANDARDS AND COMPLIANCES

- A. Gas-fired furnace section construction shall be in accordance with AGA safety standards. Furnace shall bear the AGA label.
- B. Testing and rating rooftop heating and cooling units of 135,000 btu/hr capacity or over shall be in accordance with ARI 360 "Standard for Commercial and Industrial Unitary Air-Conditioning Equipment".
- C. Testing and rating of rooftop heating and cooling units under 135,000 btu/hr capacity shall be in accordance with ARI 210 "Standard for Unitary Air-Conditioning Equipment", and provide Certified Rating Seal. Sound testing and rating of units shall be in accordance with ARI 270 "Standard for Sound Rating of Outdoor Unitary Equipment". Units shall bear Certified Rating Seal.
- D. Refrigerating system construction of rooftop units shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
- E. Energy Efficiency Ratio (EER) and Seasonal Energy Efficiency Ratio (SEER) of rooftop units shall be equal to or greater than specified within this section.
- F. Gas-fired rooftop units shall be tested and listed by UL in accordance with ANSI Z21.47 and have UL-label as a unit.
- G. Rooftop units shall be designed, manufactured, and tested in accordance with UL requirements.

1.2 WARRANTY ON COMPRESSOR AND HEAT EXCHANGER

- A. Provide written warranty, signed by manufacturer, agreeing to replace or repair, within warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
 - 1. Warranty Period: 5 years from date of substantial completion.

1.3 EXTRA MATERIALS

- A. Furnish to Owner, with receipt, the following spare parts for each rooftop heating and cooling unit:
 - 1. One set of matched fan belts for each belt-driven fan.
 - 2. One set filters for each unit.

PART 2 - PRODUCTS

2.1 ROOFTOP UNITS

- A. General: Units shall be factory-assembled and tested, designed for roof or slab installation, and consisting of compressors, condensers, evaporator coils, natural gas heat exchangers, condenser and evaporator fans, refrigeration and temperature controls, filters, dampers; capacities and electrical characteristics as scheduled.
- B. Casing: standard casing construction, having corrosion protection coating, and exterior finish. Casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1/2" thick thermal insulation, knockouts for electrical and piping connections, and an exterior condensate drain connection.
- C. Evaporator Fans: forward-curved, centrifugal, belt-driven fans with adjustable sheaves or direct-driven fans; and permanently lubricated motor bearings.
- D. Condenser Fans: propeller-type, direct-driven fans with permanently lubricated bearings.
- E. Coils: For evaporator and condenser, provide non-ferrous construction with aluminum plate fins mechanically bonded to seamless copper tubes with brazed tubing joints.

CHASE

SECTION 237436 - ROOFTOP HEATING AND COOLING UNITS

- F. Filters: MERV 13
- G. Refrigerant: R-410A
- H. Compressors: serviceable, semi-hermetic, or fully hermetic compressors. Provide vibration isolators and crankcase heaters.
- I. Efficiencies: Minimum ARI ratings of 13.0 SEER for units 3 tons through 6 tons: Minimum 80% AFUE.
- J. Efficiencies: Minimum ARI ratings of 11.0 EER for units 7.5 tons through 12.5 tons: Minimum 80% AFUE.
- K. Safety Controls:
 - 1. Low-pressure cutout.
 - 2. High-pressure cutout.
 - 3. Compressor motor overload protection.
 - 4. Gas-fired heat exchangers: manufacturer's standard construction for gas-fired heat exchangers and burners.
 - 5. Controls:
 - a. Controls and sensors as indicated in the project drawings.
 - b. Redundant gas valve.
 - c. Intermittent pilot ignition.
 - d. Electronic spark ignition system.
 - e. High limit cutout.
 - f. Forced draft proving switch.
- L. Economizer Control: economizer control consisting of return and outside air dampers, outside air filter, fully modulating electric control system with enthalpy control, and adjustable mixed-air thermostat. Design system for 100 percent outside air capability. Provide automatic changeover through adjustable enthalpy control device.
- M. Accessories: the following accessories as indicated and/or scheduled:
 - 1. Thermostat: assembly shall be for staged heating and cooling with manual or automatic changeover on standard sub-base.

PART 3 - - EXECUTION

3.1 INSTALLATION

- A. Install controls and sensors as indicated in the project drawings.

3.2 START UP AND TRAINING

- A. Start-Up rooftop heating and cooling units, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Provide services of manufacturer's technical representative for one-half day to instruct Owner's personnel in operation and maintenance of rooftop heating and cooling units.
 - 1. Schedule training with Owner; provide at least 7-day notice to Contractor and Engineer of training date. See Section 017900 – Demonstration and Training.

END OF SECTION

CHASE
SECTION 238126 - SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

- A. Shop Drawings: Diagram power, signal, and control wiring.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- E. Efficiencies: Minimum ARI ratings of 13.00 SEER for the combination of the indoor unit and condensing unit.
- F. Unit Sizes: Unit sizes of 2 ton, 3 ton, 4 ton and 5 ton.

1.5 COORDINATION

- A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carrier Air Conditioning; Div. of Carrier Corporation.

2.2 CONCEALED EVAPORATOR-FAN COMPONENTS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 - 1. Insulation: Faced, glass-fiber duct liner.
 - 2. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2004.
 - 3. Air-stream Surfaces: Surfaces in contact with the air-stream shall comply with requirements in ASHRAE 62.1-2004.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

SECTION 238126 - SPLIT SYSTEM AIR CONDITIONERS

- D. Fan Motors: Comply with requirements in Division 15 Section "Motors."
 - 1. Special Motor Features: Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.
- E. Disposable Filters: 1 inch thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 6 or higher.
- F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - 1. Compressor Type: Reciprocating.
 - 2. Refrigerant: R-410A.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.
- D. Fan: Aluminum-propeller type, directly connected to motor.
- E. Motor: Permanently lubricated, with integral thermal-overload protection.
- F. Low Ambient Kit: Permits operation down to 45 deg F.
- G. Mounting Base: Polyethylene.
- H. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings." Also see Section 1.04 Quality Assurance

2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."
- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- C. Coordinate with project electrician to provide controls and sensors as indicated in the project drawings.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."
- E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- F. Install controls and sensors as indicated in the project drawings.

3.2 CONNECTIONS

- A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.
- B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Install piping adjacent to unit to allow service and maintenance.
- D. Ground equipment according to Division 16 Section "Grounding and Bonding."
- E. Electrical Connections: Comply with requirements in Division 16 Sections for power wiring, switches, and motor controls.

3.3 STARTUP SERVICE

- A. Delete this Article if factory-authorized service representative is not required.
- B. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 DEMONSTRATION

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

END OF SECTION

CHASE
SECTION 260013 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for the Construction of Buildings, Standard Form of the American Institute of Architects, current edition, the Supplementary General Conditions, and the "Special Conditions for Mechanical & Electrical Work" are a part of these specifications.

1.2 WORK INCLUDED

- A. This specification and accompanying plans cover and shall govern the installation of a complete electrical system, all as specifically set forth herein, and as indicated in the plans.
- B. The drawings and these specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both. They are intended to include everything requisite and necessary to the entire finishing of the work notwithstanding that every item necessarily required by such work is not especially mentioned or shown.
- C. This Contractor shall furnish all labor and material necessary for the complete system and items of work including:
1. Panelboards including feeders
 2. Lighting fixtures complete with lamps
 3. Exterior lighting
 4. All branch circuit wiring
 5. Exit and emergency system
 6. Contactors, relays and the clocks.
 7. Network Building Control and Energy Management System (BMS), a web-enabled HVAC, lighting, and landscape irrigation wireless control and monitoring system, consisting of central control, processing, and communication hardware and related wireless control devices, relays, and contactors throughout the facility.
 8. Coordination with local utility companies regarding both power and communication service for this project and providing all required raceways, wiring and installation work
 9. Temporary light and power
 10. Furnish, install and connect all conduit, fittings, outlet boxes and junction boxes, complete with wiring as required and as shown on the plans, banking equipment drawings, etc. and as hereinafter specified
 11. Set, wire and connect all motors as specified and as noted on the drawings. The Contractor shall make final connections to all equipment and devices requiring electrical power furnished under this or other sections. Final connections shall be interpreted to include connections from roughing-in to any and all items requiring service
 12. System of empty conduit, outlets, junction and pull boxes, etc. for telephone/communications and Data Cable system
 13. Furnish, install and connect all switches, receptacles, recessed floor boxes and miscellaneous electrical equipment as required and as shown on the plans and as hereinafter specified
 14. Disconnect (safety) switches and motor controllers
 15. Metering equipment
 16. 8'x8'x3/4" fire rated telephone backboard
 17. 8'x8'x3/4" fire rated backboard for security equipment
- D. Contractor will distinctly understand that the work described herein is to be a finished job, and the whole completed in a workman-like manner. The omission from either the drawings or specifications of minor details that ordinarily form a part of first class work of this character and are necessary to the completion of the project as contemplated and described, shall not be a cause for any extra cost, but shall be included by this Contractor as if specifically mentioned or shown.
- E. Before ordering any materials or proceeding with the work, this Contractor shall verify all measurements at the site and be responsible for correctness of the same. No extra compensation will be allowed because of difference between the actual measurements and dimensions indicated on the drawings. Any difference that may be found shall be submitted to the Architect's Superintendent on the job for rectification before proceeding with the work.

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- F. It is specifically understood that all items of work and systems are to be furnished complete in all details, including all conduit, wiring, necessary specialties and other appurtenances required for a complete operating system.
- G. Where two types of similar equipment are specified or shown on the drawings, the Base Bid will be based on the higher quality or greater number.
- H. Definitions:
 - 1. The term "Contractor", wherever used in the Contract Documents, shall be understood to mean the Electrical Contractor or Electrical Sub-Contractor.

1.3 RELATED WORK

- A. Related work not covered by this Section includes, but not necessarily limited to the following:
 - 1. See Division 1, 22 and 23 for additional electrical work.

1.4 WORK NOT INCLUDED

- A. Temperature control equipment and system wiring will be work installed by the Temperature Control (HVAC) Contractor. Coordinate with the HVAC Contractor for procurement of HVAC sensors and controls.
- B. Telephone/Communications/Data system equipment and wiring shall be installed by the Telephone Company and/or communication system contractor.

1.5 COOPERATION AND COORDINATION

- A. Contractor shall confer with other trades at the site before installation of his work to avoid interference so that maximum headroom and clearances may be maintained. In the event that interferences develop between work and the various trades, the owner's decision will be final and no additional compensation will be allowed for the moving of
- B. Particular attention shall be paid to situations where recessed equipment, pipes and lights occur or where the work of several trades occurs together above suspended ceilings, in pipe shafts or in areas where space is limited.
- C. It is presumed that the Contractor has carefully examined the drawings, equipment drawings and specifications for the entire work and the job conditions, which will ensue before executing the agreement and has reported to the Architect in writing any interferences or conflicts with his work. If and as a result problems arise during the construction period regarding the drawings, specifications or work of the other trades, the resolutions of which shall be decided upon by the Architect. All changes made and all damage to construction shall be repaired by the Contractor without additional cost.
- D. All fixtures, equipment, devices, switches, outlets, etc. shall be positioned to avoid all interferences and assure proper coordination, with the work of all other trades, cases, partitions, wall, floor and ceiling patterns, architectural features, etc. All recessed devices, fixtures, etc. shall be coordinated with the wall, floor and ceiling patterns. The Architect will resolve conflicts and make adjustments where such are warranted.
- E. Contractor to refer to architectural floor plans, reflect ceiling plans, details, sections, room finish schedules, structural drawings, civil drawing, banking equipment drawings, mechanical, plumbing and fire protection drawing for additional work applicable to this project including project specification book.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Only products of reputable manufacturers will be acceptable.
 - 2. The Electrical contractor and his Sub-Contractors shall employ only workmen who are skilled in their respective trades.
- B. Requirements of regulatory agencies:
 - 1. All electrical work shall be in accordance with the latest edition of the National Electrical code, latest edition, and other governing bodies that have jurisdiction over this project.
 - 2. Where applicable, all fixtures, equipment and materials shall be as approved or listed by the following agencies:

SECTION 260013 - ELECTRICAL GENERAL PROVISIONS

- a. Factory Mutual Laboratories.
 - b. National Fire Protection Association.
 - c. Underwriters' Laboratories, Inc.
- C. Allowable tolerances:
- 1. Inspect Architectural, Structural, Mechanical Drawings and Equipment Drawings for all dimensions, locations of equipment, partitions and walls, structural details, and location of mechanical pipes and ducts so that the electrical installation shall be in harmony with that of the other trades.
 - 2. Exact location of equipment furnished by the other trades and wired by this Contractor shall be obtained from the Drawings of the other trades and coordinated with the installing contractor in the field.

1.7 SUBMITTALS

- A. Shop Drawings for all fixtures, equipment, materials, etc., shall be submitted as specified in Division 1.
- B. Installation, maintenance and operating manuals and instructions for all equipment shall be provided as specified in Division 1.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Exercise care in transporting and handing to avoid damage to fixtures, equipment and materials.
- B. Store materials on the site so as to prevent damage.
- C. Keep fixtures, equipment and materials clean, dry and free from deleterious conditions.
- D. Comply with pertinent provisions of Section 016600. (Product Storage and Handling)
- E. Where items of electrical equipment and/or materials are furnished by others for installation by Electrical Contractor, Electrical Contractor will be held responsible for the unloading of such equipment and/or materials from the delivery truck. Electrical Contractor shall check equipment and/or materials upon receipt and notify party furnishing items of any damaged or missing equipment.

1.9 INSTALLATION, PERFORMANCE, ERECTION

- A. In the event that conflicts, if any, cannot be settled rapidly and amicably between the affected trades, with work proceeding in a workmanlike manner, then the Owner's Field Representative shall decide which work is to be relocated, and his judgment shall be final and binding on this Contract.
- B. No measurements of a Drawing by scale shall be used as a dimension to work by. The Drawings are not intended to show complete or accurate details of the building in every respect. Exact locations and relation are to be defined in the field and shall be satisfactory to the Architect/Engineer and Owner's Field Representative. This Contractor shall take all field measurements and shall be responsible therefore.
- C. Contractor shall compare Drawings and Specifications, checking all measurements and determine intent of the contract Documents. Discrepancies shall be brought to the Architect/Engineer's attention for interpretation.
- D. The right is reserved to make any reasonable change in location of outlets and equipment prior to roughing-in without involving additional expense. Any change from the Electrical Drawings, as is necessary to make the work of this Contractor conform to the building as constructed and to fit the work of other trades, shall be included in Contractor's Contract and installed without extra costs.
- E. Electrical contractor shall install and run initial setup of central BMS equipment following the simple "Plug-and-Play" instructions provided with the equipment, and hand off final system programming to the Owner. Refer to Section 260943.

1.10 FIELD QUALITY CONTROL

- A. Testing:
 - 1. After wires are in place and connected to devices and equipment, the systems all be tested for shorts and grounds.
 - 2. All hot wires, if shorted or grounded, shall be removed and replaced.
 - 3. All grounds, shorts and high resistance splices shall be rectified.

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4. Any wiring devices, electrical apparatus or lighting fixture furnished under this Contract, if grounded or shorted on any integral "live" part, shall be removed and the trouble rectified by replacing all defective parts or materials as directed or as required.
5. Service ground to be tested per Electrical Code requirement. Provide Architect with written test report.
6. All motors shall be tested under load with ammeter readings taken in each phase. All motors shall be tested for correct direction or rotation. Electrical Contractor shall be responsible for testing and running of all motors, and shall verify that proper overload devices have been installed.
7. This Contractor at his own expense shall furnish all meters, instruments, cable connections, equipment or apparatus necessary for making all tests.
8. Provide tests as specifically mentioned in other Sections of these Specifications.

1.11 CLEANING

- A. Cleaning equipment, completed work and premises: After the completion of all installation, each system shall be thoroughly cleaned to remove all paint, oil and other foreign material. Contractor shall also clean all foreign paint, grease, oil, dirt, labels and stickers, etc., from all fixtures, equipment etc. The Contractor shall remove all rubbish, debris, etc., accumulated from his operations from the premises. Comply with pertinent provisions.
- B. Demonstration: At the conclusion of his work and before final contract payment is made, the Electrical Contractor shall demonstrate and explain to the Owner's personnel the function, operation and maintenance of all equipment and systems installed by him.

1.12 SCHEDULES

- A. Equipment Schedules: See Drawings for Schedules of lighting fixtures, electrical panels, and related items.

1.13 BROCHURES

- A. Prior to final acceptance, provide bound brochures containing copies of the following:
 1. Approved submittal data.
 2. Equipment guarantees.
 3. Contractor guarantees.
 4. Maintenance and other operating instructions and spare parts lists for all equipment.
 5. Control diagrams.

1.14 IDENTIFICATION AND TAGGING

- A. Provide all distribution switches and/or circuit breakers, motor controllers, whether individually mounted or in panelboards, switchboards, motor control centers, etc., with suitable identifications as to both the designation of the feeder controlled and load served, using nomenclature shown on drawings.
- B. Provide all feeders with suitable identification as to their designation in all junction boxes, pull boxes, gutter spaces through which they pass, and at their terminal points of connection.
- C. Identification of distribution switches or circuit breakers in panelboards shall be by means of panelboard directories. Identification of distribution switches, circuit breakers or motor controllers, individually mounted or in switchboards or motor control centers shall be by means of engraved lamacoid nameplates permanently fastened on the front face of the housing showing 1/4" high white lettering on a black background.
- D. Identification of feed cables shall be by means of engraved fiber tags suitably fastened to the cables.

1.15 SLEEVES

- A. Contractor shall provide sleeves in walls and floor slabs for the passage of all conduits, pipes and ducts installed by him. Sleeves shall be set in place in sufficient time ahead of the concrete and masonry work so as not to delay that work. Coordinate this work with the contractors for the respective construction materials to be penetrated.

SECTION 260013 - ELECTRICAL GENERAL PROVISIONS

- B. Sleeves through floor shall extend three inches above finished floor level and shall be made watertight.
- C. When many conduits pass through a wall at a single location, that opening shall be completely closed by grouting with concrete, the full thickness of the wall.

1.16 PAINTING

- A. All equipment, panelboards, switchboards, etc., shall be factory finished in baked enamel or lacquer, or as specified. Standard factory finished shall be approved. The installing Contractor shall neatly touch up any scratches.
- B. All metal work installed by this Contractor, exposed to the weather and not factory finished, shall be painted with one coat of primer and two coats of oil base paint of color selected by Architect.

1.17 SHOP DRAWINGS

- A. Comply with pertinent provisions of Division 1.
- B. Provide equipment Shop Drawings which includes, but is not necessarily limited to, the following:
 - 1. Panelboards
 - 2. Contactors, relays and time clocks
 - 3. Disconnect switches
 - 4. Interior and exterior light fixtures, including lamps (furnished by E.C.)
 - 5. Wiring devices
 - 6. Metering equipment
 - 7. Motor controllers

1.18 PERMITS

- A. Contractor to provide all permits and fees for the performance of his work. The building permit will be by others.
- B. The Electrical Contractor shall provide necessary drawings to Fire Prevention Bureau and Electrical Inspection Bureau for approval.
- C. Contractor shall obtain all approvals from the bodies which have jurisdiction over this project.

1.19 SLEEVES, CUTTING, PATCHING AND SUPPORTS

- A. Contractor shall furnish and set sleeves, inserts, etc., required for installation of his work and be responsible for the final and permanent locations.
- B. Contractor shall give the General Contractor complete information as to size of openings in floors, walls, etc., so that such openings may be provided as the building progresses.
- C. If openings are omitted or incorrect through failure to follow above instructions, the Contractor shall engage the Contractor for general construction to cut the patch at his own expense to the satisfaction of the Architect.
- D. Conduits passing through roofs or other surfaces exposed to weather shall be properly flashed as specified in Roofing and Waterproofing Sections of the General Specifications. This flashing shall be paid for as part of the electrical work.
- E. Sleeves installed through slabs shall be packed or filled as directed after conduit is in place. Filling shall provide a waterproof and fireproof packing around conduit to prevent leakage of liquids, smoke or fire from floor above into ceiling.
- F. Sleeves for conduits shall be mild steel tube, galvanized inside and outside, equal to rigid conduit.
- G. All supports will be galvanized angles or channels supported with 3/8" threaded rods anchored to the building construction.
- H. Height of outlets and devices is indicated on the drawings. Use the following as a guide for mounting of outlet boxes where not clearly indicated in the drawings. Final mounting height to be field verified with architect and/or owners representative. Refer to local code and ADA requirements for specific device heights.

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Device	Height Above Finished Floor to Bottom of Box
Receptacles (Office and Corridors)	18"
Receptacles (Counters and unfinished areas)	44"
Switches	44"
Clock Outlets	88"
Telephone/Data Outlet	
Wall	44"
Desk	36"
Public	44"
Fire Alarm Break Glass Stations	44"
Fire Alarm Horns/Lights	96"

- I. Coordinate height of outlets with drawings and equipment installations drawings prior to rough-in and properly locate height of all outlets.

1.20 SEALING

A. Fire Seals

1. Seal penetrations of fire-rated walls, all floors or ceilings at raceways for compliance with NEC 300-21. Fill void around raceway. Sleeves shall be heavy wall steel pipe, anchored to building construction and finished plumb with wall, ceiling or floor lines.

B. Acceptable Manufacturers:

1. Dow Corning - Fire Stop
2. Nelson - Flameseal
3. T&B - Flamesafe
4. 3M - Fire Barrier

C. Smoke and Fire stop fittings may be used instead of above sealant.

D. Acceptable Manufacturers:

1. O Z/Gedney, Series CFS

E. Thermal Seal: Seal penetrations of thermally insulated equipment or rooms to prevent heat transfer. Seal exterior of raceway with fiberglass or other material compatible to equipment or room and approved by Architect/Engineer. Seal interior of raceway with duct sealing compound at entry to equipment or room.

F. Water Seal: Seal penetrations of perimeter walls or floors below grade to prevent entry of water. Use materials compatible with wall or floor construction and approved by Architect/Engineer. Seal roof penetrations with flashings compatible with roof design and approved by Roofing and System Manufacture and Architect/Engineer.

1.21 NAME PLATES AND EQUIPMENT DESIGNATIONS

A. In addition to nameplates specified elsewhere herein, furnish and install engraved white core laminated micarta nameplates for all motor starters and disconnect switches, safety switches, time switches, magnetic contactors, relays, overhead door operator, push button stations, etc., furnished under this Contract.

B. Others will furnish nameplates to this contractor for equipment furnished under their particular branch of work. Electric Wiring Contractor shall install all such nameplates on equipment for which such nameplates are intended.

C. Nameplate designations shall be as later directed by the Engineer.

D. Provide stick-on "voltage" name tags on the following equipment:

1. On all starters, on outside covers
2. On all disconnect switches, on outside covers.
3. On all panels (on inside of door for recessed panels).
4. On timers, relays, contactors, etc.

E. Timers, relays and contactors indicating their function.

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- F. All lettering of voltage and motor number designations shall be minimum 1/4" high.
- G. Provide stick-on name tags on all motor starters giving pump or fan number designation, and on all timers, relays and contactors indicating their function.
- H. All lettering of voltage and motor number designations shall be minimum 1/4" high.

1.22 EXAMINATION OF SITE

- A. Visit the site to ascertain the complete scope of work before submitting bid.

1.23 OCCUPANCY

- A. Owner, or others whom he may designate, shall be privileged to enter and occupy the building or portions thereof, at any time prior to completion, without prejudice.

1.24 RECORD DRAWINGS

- A. Upon completion of the job, the contractor shall submit a clean set of prints marked in red pen or pencil to indicate all deviations from the Drawings and Specifications.
- B. A record of deviations shall be kept throughout the progress of the job and shall be used in the preparation of the "record" Drawings.
- C. The "record" Drawings shall indicate all changes in branch circuit work, feeders, and location of apparatus, lighting fixtures and wiring devices.

1.25 INSTRUCTION OF OWNER'S PERSONNEL

- A. Within 30 days after construction is complete and at a time convenient to the Owner, the Contractor shall furnish qualified mechanics for a period of one (1) day to thoroughly familiarize the Owner's personnel with the operation and maintenance of the electrical systems.

END OF SECTION

PART 1 - GENERAL**1.1 SUBMITTALS**

- A. Submit Product Data for supporting devices and electrical identification.

1.2 QUALITY ASSURANCE

- A. Comply with NFPA 70 for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

PART 2 - PRODUCTS**2.1 BUILDING WIRE**

- A. Single conductor, copper. Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.
 - 1. Thermoplastic Insulated Wire: Conform to NEMA WC 5.
 - 2. Cross-Linked, Polyethylene Insulated Wire: Conform to NEMA WC 7.
 - 3. Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated. Select to comply with Project's installation requirements.

2.2 GENERAL SUPPORT FOR ELECTRICAL COMPONENTS

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.

2.3 STEEL CHANNEL SUPPORTS

- A. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.

2.4 NONMETALLIC CHANNEL AND ANGLE SYSTEMS

- A. Structural-grade, factory-formed, fiberglass-resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Fittings and accessories mate and match with channels or angles and are from the same manufacturer.
 - 2. Fitting and Accessory Material: Same as channels and angles, except metal items may be stainless steel.

2.5 ACCESSORIES

- A. Sheet-metal sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- B. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- C. Expansion Anchors: Carbon-steel wedge or sleeve type.
- D. Toggle Bolts: All-steel springhead type.
- E. Powder-Driven Threaded Studs: Heat-treated steel.
- F. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 3 mils thick by 1 inch wide.

- G. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Size: Not less than 4 mils thick by 6 inches wide.
 - a. Compounded for permanent direct-burial service.
 - 2. Embedded continuous metallic strip or core.
 - a. Printed Legend: Indicates type of underground line.
- H. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- I. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- J. Interior Warning and Caution Signs: Preprinted, aluminum, baked-enamel finish signs, punched for fasteners, with colors, legend, and size appropriate to the application.
- K. Exterior Warning and Caution Signs: Weather-resistant, non-fading, preprinted, cellulose acetate butyrate signs with 0.0396-inch, galvanized steel backing. Colors, legend, and size appropriate to the application and 1/4-inch grommets in corners for mounting.
- L. Fasteners for Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.
- M. Meter Sockets: Comply with serving utility company requirements.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Give right of way to raceways and piping systems installed at a required slope.
- E. The complete electrical installation, light fixtures, conduit, boxes, wiring, etc. in plenum ceiling areas shall be done in strict compliance with all state, national and local codes which have jurisdiction over this project.

3.2 FEEDERS

- A. Feeders: Type THHN/THWN or XHHW, copper conductor, in raceway, except as otherwise indicated.
- B. Underground Feeders: Type XHHW, copper conductor, 90C insulation, in raceway, except as otherwise indicated.

3.3 CIRCUITS

- A. Branch Circuits: Type THHN/THWN, in raceway.
- B. Class 2 and Class 3 Control Circuits: Type THHN/THWN, in raceway.

3.4 WIRING, RACEWAYS AND SUPPORTS

- A. Damp Locations and Outdoors Supports: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations Supports: Steel materials.
- C. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb-minimum design load.
- D. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."

- E. Conductor Splices: Keep to the minimum and comply with the following:
 - 1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 2. Use splice and tap connectors that are compatible with conductor material.
- F. Wiring at Outlets: Install with at least 12 inches of slack conductor at each outlet.
- G. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- H. Install devices to securely and permanently fasten and support electrical components.
- I. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 1. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 2. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 - 3. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 - 4. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 - 5. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 - 6. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.
 - 7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- J. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.
- K. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

3.5 SLEEVES

- A. Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

3.6 FIRESTOPPING

- A. Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform firestopping as specified in Division 7 Section "Penetration Firestopping" to reestablish the original fire-resistance rating of the assembly at the penetration.

3.7 FASTENING

- A. Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:
 - 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
 - 2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.

CHASE

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
4. In partitions of light steel construction use sheet-metal screws.
5. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.
6. Drill holes in concrete so holes more than 3/4 inch deep do not cut main reinforcing bars.
7. Fill and seal holes drilled in concrete and not used.
8. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

3.8 CONCRETE PADS AND METERING EQUIPMENT

- A. Install concrete pads and bases according to requirements of Division 3 Section "Cast-in-Place Concrete."
- B. Install utility-metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.9 IDENTIFICATION

- A. Install identification devices where required.
 1. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
 2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.
 3. Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.
 4. Tag or label power circuits for future connection and circuits in raceways and enclosures with other circuits. Identify source and circuit numbers in each cabinet, pull box, junction box, and outlet box. Color-coding may be used for voltage and phase indication.
 5. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, use a single line marker.
 6. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.10 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved. Repair disturbed surfaces to match adjacent undisturbed surfaces.

END OF SECTION

CHASE

SECTION 260519 – LOW VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, A.I.A., A201, Latest Edition, and the Supplementary General Conditions are a part of the Contract for this work. Contractor shall consult them and General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the Drawings applying to this work are also a part of this Section.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, tools and equipment, including incidental items required for a complete and proper installation.

1.3 QUALITY ASSURANCE

- A. All wire and cable shall be listed by Underwriters' Laboratories, Inc., and bear the Underwriters' Laboratories, Inc. (U.L.) label.
- B. All conductors shall be not less than indicated on Drawings and not less than required by the N.E.C.
- C. All wire and cable shall be copper, 98% conductivity, with 600 volt insulation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wire and cable for building interior: Sizes #14 through #10 shall be type THHN/THWN solid copper; sizes #8 and larger shall be type THHN/THWN or XHHW stranded copper.
- B. Where light fixtures are wired in continuous rows, wire pulled through fixtures shall be THHN 90 degrees Centigrade copper, 600 volt insulation.
- C. All wire and cable shall be installed in conduit systems, GRS, IMC, or EMT. Flexible conduits are permitted only at the ends of conduit runs, as equipment or fixture "whips". The use of armored or metal-sheathed cables (Types AC and MC) and non-metallic sheathed cables, (Types NM, NMC and NMS) shall not be permitted.

2.2 MANUFACTURERS

- A. Wire and cable to be Okonite Co., Triangle, Rome or Phelps-Dodge copper products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wire and Cables:
 - 1. All wiring shall be installed in approved metal raceway systems.
 - 2. Wire shall not be installed in conduit or raceways until they are free from moisture and foreign matter.
 - 3. Where exterior conduits enter the inside of the building, the end of the conduit must be sealed after all conductors have been installed.
 - 4. All joints shall be made in boxes where they will be accessible.
 - 5. Pull or junction boxes as required by the N.E.C. must be provided as required to facilitate installation of conductors.
 - 6. Support of vertical conductors shall be in accordance with the N.E.C.
 - 7. #8 and smaller conductor joints shall be thoroughly cleaned to bright metal and joined with indenture-compression or screw-on compression type connectors as permitted by the N.E.C. Sizes shall be as recommended by the manufacturers of the connectors for the quantities and sizes of wires being connected.
 - 8. All exposed wires, clamps or connectors shall be completely insulated with vinyl plastic tape.
 - 9. All branch circuit wires shall be permanently identified with circuit numbers, securely fastened to wire at cabinets at the time the wires are pulled in and tested.

CHASE

SECTION 260519 – LOW VOLTAGE CONDUCTORS AND CABLES

10. Sufficient wire shall be left at each junction box and outlet to accommodate future taps. Leave minimum 6" loops or ends at each location.
11. For panelboards, cabinets, wireways, switches and equipment assemblies, neatly form and tie the wiring with sturdy cable ties and straps which will withstand substantial temperature rises without becoming loose.
12. Branch circuit conductors shall be color-coded as follows:

<u>120/208 Volts</u>	<u>Phase</u>
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground
13. Wire Pulling Lubricant: Use of wire pulling lubricant is optional, but if needed to prevent damage to the conductors, it must be listed by Underwriters' Laboratories, Inc., and be of such consistency that it will leave no obstruction nor tackiness that will prevent pulling out old wires or pulling in new wires or additional wires.
14. Conductors larger than #8 shall be thoroughly cleaned to bright metal and joined with indenture-compression type connectors.
15. Special attention shall be given to connections and terminations where dissimilar metals are used as copper to aluminum. Only the use of pressure type solderless connectors that are suitable for the use shall be installed.
16. Prior to final inspection, test the installed cables and wires. Prior to energizing the wires and cables, check them for correct connections and test them for short circuits, ground faults, continuity and insulation.
17. Final connections to all light fixtures shall be made with minimum #12 THHN solid copper wire.
18. Home runs over 100 feet for 120v, 1 phase shall have a minimum size of #10 AWG for home run.
19. Main service and feeder connections shall be made using two bolt lugs with back washer.
20. Minimum size branch circuit conductor shall be #12 AWG.

END OF SECTION

CHASE
SECTION 260526 - GROUNDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide a completely grounded system. All electrical equipment, conduits, supports, cabinets, panelboards shall be grounded in accordance with the NEC and/or as shown on the Drawings. The intent is a system and an equipment ground.
- B. Extent of Work is as shown on the Drawings or herein specified in Division 26.

1.2 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. NFPA 70.
 - 2. NEMA.
 - 3. U.L. Listed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Connectors:
 - 1. Burndy Corp.
 - 2. O.Z. Electrical Mfg. Co.
 - 3. Buchanan Electrical Products Corp.
 - 4. Penn-Union Electric.
 - 5. Anderson Electric Corp.
- B. Ground rods:
 - 1. Anderson Electric Corp.
 - 2. Copperweld Corp.
 - 3. Penn Union Electrical Corp.

2.2 MATERIALS

- A. Ground rods shall be copper weld rods 3/4" in diameter as specified or required length as noted on the Drawings.
- B. Connectors shall be industry standard type for connecting grounds, splicing, taping and the like.
- C. Electrode clamps, connectors, mechanical lugs or wire terminals shall be used to bond ground wires together or to junction and panel boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal contact.
- B. Grounding conductors shall be so installed as to permit shortness and most direct path from equipment to ground; be installed in metal conduit with both conductor and conduit bonded at each end; have connections accessible for inspection and made with approved solderless connectors braced (or bolted) to the equipment or structure to be grounded; in NO case be a current carrying conductor; have a green jacket unless it is bare copper; be run in conduit with power conductors or in the case of multi-conductor cable run inside the cable sheath.
- C. All exterior grade mounted equipment shall have their enclosures grounded directly to a separate driven ground at the equipment in addition to the building ground connection. This includes grade mounted light fixtures.

CHASE

SECTION 260526 - GROUNDING FOR ELECTRICAL SYSTEMS

- D. A main building ground, bare copper conductor, NEC sized but in no case less than #3/0, shall be run in conduit from the main service panel to a driven ground field outside the building. This ground shall be extended to the main water service metal pipe and to a main structural steel member of the building. Provide a properly sized bonding shunt strap around the meter and all dielectric unions in the water pipe.
- E. Tests: The resistance between ground and absolute earth shall not exceed 25 ohms and shall be measured by the Electrical Subcontractor in the presence of the Architect before equipment is placed in operation.

END OF SECTION

CHASE
SECTION 260531 - CONDUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, A.I.A. A201, Latest Edition, and the Supplementary General Conditions are a part of the Contract for this Work. Contractor shall consult them and the General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the Drawings applying to this work are also a part of this Section.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, tools and equipment, including incidental items required for work of their Section as shown on the Drawings specified herein, and as required for a complete and proper installation.
 - 1. Furnish and install conduits for all wiring of type called for and as required for this project.

1.3 QUALITY ASSURANCE

- A. All conduits shall bear label of the Underwriters' Laboratories, Inc., and sized in accordance with the N.E.C.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Conduit:
 - 1. Galvanized rigid steel (GRS): Hot dipped galvanized rigid steel with threaded ends. Meet ASTM standard A-153 galvanized after fabrication.
 - 2. Intermediate Metal Conduit (IMC): Rigid mild steel tube with welded seams, hot dipped galvanized with threaded ends.
 - 3. Thin Wall: Electro-galvanized electrical metallic tubing (EMT).
 - 4. Flexible: Hot dipped galvanized material of mild steel of uniform width and thickness.
 - 5. Flexible Liquid Tight: Hot dipped galvanized material of mild shell of uniform width and thickness with extruded moisture and oil proof PVC jacket.
- B. Conduit Fittings:
 - 1. GRS Conduit: Threaded type.
 - 2. IMC Conduit: Threaded type.
 - 3. Thinwall or EMT: Rain-tight and concrete-tight, gland compression type, insulated nylon throat with die-cast body and steel nut, Appleton type 86T series or equal. For conduit sizes 3" and larger (where not required to be rain or concrete tight) set-screw type is acceptable.
 - 4. Flexible Conduit: Single or two piece squeeze type.
 - 5. Flexible Liquid Type: Compression type.
- C. Prohibited materials:
 - 1. Armored and metal-sheathed cables, types AC and MC, shall not be permitted.
 - 2. Non-metallic sheathed cables, types NM, NMC and NMS, shall not be permitted.

2.2 MANUFACTURERS

- A. Conduit to be Republic Steel Corporation, Triangle, Youngstown Sheet and Tube, or Allied.
- B. Conduit fittings to be Appleton Electric Co., Raco, Inc., or Thomas & Betts Co.

PART 3 - EXECUTION

3.1 PREPARATION, INSTALLATION, APPLICATION

- A. Conduit Installation - Conduit Layout:
 - 1. Where conduit is exposed, give special attention to appearance of completed installation.
 - 2. Run parallel or perpendicular to exterior walls of buildings.
 - 3. Locate to avoid equipment, fixtures, ductwork, piping, etc.

CHASE
SECTION 260531 - CONDUITS

4. Lay out and install work in advance of the laying of floors, walls, etc., and furnish and install all sleeves that may be required for openings through floors, walls, etc.
 5. Where Plans call for conduit to be run exposed, furnish, and install all inserts and clamps for the supporting of conduit.
 6. If Contractor does not properly install all sleeves and inserts required, he will be required to do the necessary cutting and patching later, at his own expense and to the satisfaction of the Engineer and Owner.
 7. Do not obstruct openings or passageways.
 8. Where conduit passes through floors, or through smoke and fire walls, perform firestopping as specified in division 7, section "Firestopping" as reestablish the original fire resistance rating of the assembly at the penetration.
 9. Radius of bends shall be not less than six (6) internal diameters. Any run of conduit shall not include more than the equivalent of three (3) quarter bends. Provide pull box if a greater number of bends are required.
 10. All conduits shall be concealed, except where specifically indicated as exposed.
 11. Outside diameter of any conduit run in concrete slab shall not exceed 1/3 of thickness of slab.
 12. Install accessible pull boxes in all conduit runs exceeding 150 ft.
 13. All conduits install under concrete slab in grade shall be encased in 3" concrete envelope.
 14. Conduits crossing building expansion joints shall be provided with approved grounding expansion fittings where they cross these joints.
 15. Underground conduits shall be blown and swabbed before conductors are pulled.
 16. Provide fish wire in all empty and spare conduits.
 17. Conduit shall be a minimum of ½".
 18. All wiring shall be run in conduit. Where heavy wall galvanized rigid steel (GRS) is not required, thin wall (EMT) may be used.
 19. Provide concrete encasement of service conduits when required by local authorities and/or utility companies.
 20. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finished similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere indicated:
 - a. Where conduits enter or leave hazardous locations.
 - b. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 - c. Where otherwise required by the National Electrical Code.
- B. Cutting:
1. Measure and cut conduit from job site conditions, not from Drawings.
 2. Conduit shall be cut square, reamed and butted solidly into fittings.
 3. On GRS and IMC conduit, cut thread full and clean with sharp dies. Ream ends of pipe after threading and before assembly to remove burrs.
 4. Ream thin-wall conduit (EMT) after it is cut.
 5. Use tapered threads where conduit cannot be coupled using standards couplings; use OZ or Erickson split type coupling.
 6. Threaded joints in concrete slabs or underground shall receive a coat of pipe sealant or pipe jointing compound.
 7. All conduit ends shall be plugged with an approved device to prevent the entrance of foreign material.
- C. Type of Conduit: Conduit buried in floors on or below grade, service conduit, and conduit on building exterior or exposed to moisture shall be GRS or IMC; other conduit may be IMC or thinwall (EMT). Conduit must be installed as a complete system, continuous from outlet to outlet and shall be mechanically and electrically connected. The entire conduit system must be grounded. Minimum size conduit shall be ½ inch conduit.
- D. Supporting of Conduit:
1. Supports to be at least ten feet (10') maximum intervals.
 2. Conduit to be independently supported from building structure and not from water piping, ductwork, etc.

CHASE
SECTION 260531 - CONDUITS

3. Conduit shall be installed to avoid moisture traps.
 4. Where conduit is to be installed in poured concrete floors or walls, securely fasten conduits to forms or reinforcing to prevent conduit misplacement.
 5. Supply exposed conduits with galvanized metal straps or clips. Where grouped, conduit shall be neatly racked, supported by suitable trapeze or pipe hangers; run parallel with and at right angles to beams and walls. Perforated straphangers are not approved.
- E. Flexible Conduit:
1. Provide liquid-tight flexible metallic conduit connections to all motors and movable equipment and where required to prevent transmission of vibration or to permit flexibility for movement of equipment.
 2. Flexible connections to recessed fixtures in dry locations may be flexible metallic tubing without liquid-tight jackets.
 3. Provide bonding jumper wire where required by code.
 4. Where required by local code, provide liquid-tight flexible conduit in plenum ceiling areas for connection to lighting fixtures, speakers, etc.
- F. Surface Metal Raceway:
1. Where indicated on the Drawings, provide surface metal raceways with associated fittings, boxes, devices and supports as manufactured by Wiremold, Walker Duct or National Electric Co.
 2. Raceways shall be sized in accordance with NEC to accommodate the number and size of conductors being installed.

END OF SECTION

CHASE
SECTION 260532 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the contract for Construction, AIA. A201, Latest Edition, and the Supplementary General Conditions are a part of the Contract for this work. Contractor shall consult them and the General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the drawings applying to this work are also a part of this section.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, tools and equipment, including incidental items required for work of this Section as shown on the drawings, specified herein, and as required for a complete and proper installation.
 - 1. Furnish and install outlet boxes as called for, where required and as shown on the Drawings.

1.3 QUALITY ASSURANCE

- A. Dimensions shall be not less than required by N.E.C. and not less than indicated on the drawings.
- B. Underwriters' Laboratories, Inc. shall list all outlet boxes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Boxes shall be 12 gauge or heavier steel, sheradized or galvanized to prevent rusting and shall have readily removable knockouts. Cast metal boxes shall be rustproof.
- B. Boxes shall:
 - 1. Match conduit construction.
 - 2. Be provided with more conduit terminations than required.
 - 3. Accommodate required joints and conductors.
 - 4. In or on wall (not WP) - galvanized steel one gang box for one conduit termination; two gang boxes or larger or deep masonry box for conductors, conductor joints and conduit terminations; cover as required for device.
 - 5. In or on ceiling (not WP) - galvanized steel; 4" octagonal (or larger) for one fixture; fixture studs; supported independently of conduit.
 - 6. In or on walls of damp locations, rooms below 50 degrees F, in or on exterior side of wall, floor or roof - gasketed, watertight (WP), galvanized, cast iron or non-ferrous.

2.2 MANUFACTURERS

- A. Outlet boxes to be Appleton, Raco or Steel City

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Outlet Boxes:
 - 1. Boxes for concealed conduits and EMT shall be flush mounted. Other boxes may be flush or surface type.
 - 2. Install plaster rings at plastered surfaces.
 - 3. Install tile cover rings (extensions) for devices at non-plastered surfaces.
 - 4. In addition to boxes indicated, install enough boxes to prevent damage to cables and wires during pulling operations.
 - 5. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
 - 6. Boxes shall be supported independently of conduit.
 - 7. Fit boxes into available space, construction and surface materials.
 - 8. For additional conduit termination, more conductors and more conductor joins, provide additional boxes in keeping with code requirements.

CHASE

SECTION 260532 - BOXES FOR ELECTRICAL SYSTEMS

9. For gang installations: Switches mounted in a common box for gang installation shall be so arranged that the voltage between adjacent switches does not exceed 300 volts, or permanent barriers must be installed between the adjacent switches.
10. Mount all boxes at height shown on the drawings, or as directed.
11. The approximate location of outlet boxes is shown on the Drawings, but care shall be taken to install all outlets with proper relation to equipment or material to be installed by other trades.
12. Where required by local code, provide special gasketed outlet boxes with special knockouts in plenum ceiling areas.
13. In Fan and Machinery Rooms and areas, exact locations and mounting height of fixtures shall be coordinated so as to clear all ducts, fan housings, tanks, pipes, etc., and obtain uniform light distribution; therefore, all outlets and conduits serving same in these rooms shall be run exposed in a neat symmetrical manner after this equipment is installed in place.

END OF SECTION

CHASE
SECTION 260533 - PULL AND JUNCTION BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, A.I.A. A201, Latest edition, and the Supplementary General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the Drawings apply to this work are also part of this Section.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, tools, and equipment, including incidental items required for work of this Section as shown on the Drawings, specified herein, and as required for a complete and proper installation.

1.3 QUALITY ASSURANCE

Dimensions shall be not less than required by N.E.C. and not less than indicated on the Drawings.

- A. Underwriters' Laboratories, Inc. standards shall apply.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Boxes shall be made of galvanized sheet steel of code thickness with screw covers, unless otherwise specified.
- B. Boxes shall be cast metal where required by code or where indicated on the Drawings. Cast metal boxes shall be rustproof.

2.2 MANUFACTURERS

- A. Junction and pull boxes shall be Appleton, Arlington Sheet Metal Corp., Crouse-Hindes, EPI-Electrical Enclosures or Hoffman.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Junction and Pull Boxes:
 - 1. Pull or junction boxes shall be installed in all conduit runs having the equivalent of three (3) 90 bends, and/or more than 150 feet in length. This shall be the minimum requirement. Additional pull boxes shall be installed as required for a workmanlike job and/or as to prevent damage to cables and wires during pulling operations.
 - 2. Install pull or junction boxes concealed except in unfinished areas or exposed work.
 - 3. Field-drill the boxes for conduit sizes and locations as required.
 - 4. All cables entering or leaving metal boxes shall be protected by the use of insulated throat bushing and double locknuts on GRS or IMC conduit, and by insulation throat box connectors for EMT conduit.
 - 5. Common boxes used for gang installation shall include barriers between power and low voltage circuits.

END OF SECTION

CHASE
SECTION 260534 - SWITCHES AND RECEPTACLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, A.I.A. A201, Latest Edition, and the Supplementary General Conditions are a part of the Contract for this work. Contractor shall consult them and the General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the Drawings applying to this work are also part of this Section.

1.2 WORK INCLUDED

- A. Furnish all labor, materials, tools and equipment, including incidental items required for work of this Section as shown on the Drawings, specified herein, or as required for a complete and proper installation.
 - 1. Provide wiring devices as scheduled herein and as called for on the Drawings.
 - 2. Provide device plates for all wiring devices.

1.3 QUALITY ASSURANCE

- A. Wiring devices shall be Underwriters' Laboratories, Inc. listed and rated per N.E.C.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wall Switches:
 - 1. Hardwired wall switches: Single unit, toggle, butt contact, quiet type with integral mounting strap, rated for 15 or 20 amps, 120/277 volts, installed 44 inches above finished floor, or as noted, (specification grade).
 - 2. Wireless wall switches: Refer to Section 260943.
- B. Receptacles:
 - 1. Duplex convenience receptacles shall be polarized grounding type, rated 20 amps at 120 volts and installed 18" above finished floor, unless noted otherwise (specification grade).
 - 2. Isolated ground receptacles, equipment-grounding contacts are connected to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.
 - a. Devices: Listed and labeled as isolated ground receptacles.
 - b. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.
 - 3. Ground-fault circuit interrupter (GFCI) receptacles, UL standard 943, "Ground Fault Circuit Interrupters", feed-through type, with integral NEMA 5-20 R Duplex receptacle.
- C. Occupancy sensors shall include the following features or characteristics
 - 1. Passive infrared motion detection.
 - 2. Compatibility with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
 - 3. Occupancy detection within a 180-degree field of view.
 - 4. Manual on/off control.
 - 5. Manual configuration of range and time settings.
 - 6. Refer to Section 260943.
- D. Timer switches shall include the following features or characteristics
 - 1. Buttons for 5- 10- 15- 30-minute ON and OFF.
 - 2. 3-way circuit compatibility.
 - 3. Minimum 1/6 HP fan capacity.
- E. Wall plates:
 - 1. Plates for boxes, switches, outlets, devices, etc., in all finished areas shall be identical and shall be of high impact plastic material.
 - 2. Plates in unfinished areas shall be galvanized steel.

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F. Device and wall plate color:

1. In all finished areas, all wiring devices and cover plates shall be identical and shall be of high impact plastic material the color as noted in the Electrical Device Finishes schedule in the drawings, unless noted otherwise or as directed. Final color selection to be coordinated with the Architect prior to ordering devices.
2. Devices in unfinished areas shall be white, unless otherwise noted in the drawings.

2.2 MANUFACTURER'S & CATALOG NUMBERS

A. Hardwired wall switches (Fed. Spec. WS-896E):

1. Single pole, toggle type:

<u>15 AMP Devices</u>		<u>20 AMP Devices</u>	
P&S	#20AC1	P&S	#20AC1
Hubbell	#1221 or #1201	Hubbell	#1221
Eagle	#1201	Eagle	#2221

2. 3-way toggle type:

<u>15 AMP Devices</u>		<u>20 AMP Devices</u>	
P&S	#20AC3	P&S	#20AC3
Hubbell		#1223	Hubbell #1221
Eagle	#1203	Eagle	#2223

B. Wireless wall switches: refer to the drawings and Section 260943.

C. Receptacles:

1. Duplex Convenience Receptacle (Fed. Spec. WC-590-F).

<u>15 AMP Devices(NEMA #5-15R)</u>		<u>20 AMP Devices(NEMA #5-20R)</u>	
P&S	#5262	P&S	#5362
Hubbell	#5262	Hubbell	#5362
Eagle	#5262	Eagle	#5362

2. Isolated Ground Type Duplex Receptacle

<u>15 AMP Devices(NEMA #5-15R)</u>		<u>20 AMP Devices(NEMA #5-20R)</u>	
P&S	#IG6200	P&S	#IG6300
Hubbell	#IG5262	Hubbell	#IG5362
Eagle	#IG5262	Eagle	#IG5362

3. GFI Receptacle

<u>15 AMP Devices(NEMA #5-15R)</u>		<u>20 AMP Devices(NEMA #5-20R)</u>	
P&S	#1591-FI	P&S	#2091-F
Hubbell	#GF-5262-I	Hubbell	#GR-5362
Eagle	#646-2	Eagle	#647-2

D. Wall occupancy sensor, single circuit

1. Where required by jurisdictions having authority to provide manual-on operation, switches with a "vacancy" mode option, or alternate "vacancy" function models shall be provided.
2. Where required by jurisdictions having authority to provide bi-level operation, the manufacturer's matching switches with bi-level control shall be provided.
3. Refer to the drawings. Listed model numbers are based on product availability, and are subject to change without notice. Verify compatibility of suggested model numbers with project-specific circuiting and control requirements, and adjust as necessary to achieve design intent

E. Wall occupancy sensor, 3/4-way

1. Where required by jurisdictions having authority to provide manual-on operation, switches with a "vacancy" mode option, or alternate "vacancy" function models shall be provided.
2. Refer to the drawings. Listed model numbers are based on product availability, and are subject to change without notice. Verify compatibility of suggested model numbers with project-specific circuiting and control requirements, and adjust as necessary to achieve design intent.

F. Wall occupancy sensor, dual circuit, 3/4-way

1. Where required by jurisdictions having authority to provide manual-on operation, switches with a "vacancy" mode option, or alternate "vacancy" function models shall be provided.
2. Refer to the drawings. Listed model numbers are based on product availability, and are subject to change without notice. Verify compatibility of suggested model numbers with project-specific circuiting and control requirements, and adjust as necessary to achieve design intent.

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- G. Ceiling occupancy sensor
 - 1. Refer to the drawings. Listed model numbers are based on product availability, and are subject to change without notice. Verify compatibility of suggested model numbers with project-specific circuiting and control requirements, and adjust as necessary to achieve design intent.
- H. Wall plates shall be as manufactured by the device manufacturer.

PART 3 - EXECUTION

3.1 WIRING DEVICE INSTALLATION

- A. Each outlet, device or piece of equipment of every kind shall be located approximately as called for and as directed. Outlet locations shall be checked for interference with all plumbing, heating, ventilating, other work and with Architectural Drawings. Outlets must be located in harmony with architectural design of ceilings, wall and floors. Switches shall be located on latch side (jamb) of door. Receptacles must be located to avoid interference with all other equipment provided under all other divisions.
- B. Any outlet and/or device, which does not conform to the above, shall be relocated by the Electrical Contractor at no increase in Contract price.
- C. Unless otherwise noted or directed, switches, receptacles, devices etc., shall be carefully recessed with boxes and plates properly arranged to cover all cracks or spaces between box and wall finish.
- D. All outlets 18" above floor shall be mounted horizontally. All outlets mounted 44" and higher shall be mounted vertically. All receptacles above counter-top height shall be mounted horizontally and switches above counter-top height shall be mounted vertically.
- E. Switches shall be installed 44" to centerline of switch plate.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This section supersedes Section 230900 – INSTRUMENTATION AND CONTROL FOR HVAC.

1.2 RELATED SECTIONS

- A. 230013 - HVAC GENERAL PROVISIONS
- B. 233423 - HVAC POWER VENTILATORS
- C. 236400 – CONDENSING UNITS
- D. 237436 – ROOFTOP HEATING AND COOLING UNITS
- E. 238126 – SPLIT SYSTEM AIR CONDITIONERS

1.3 SUMMARY

- A. The control system specified in this section shall provide controls based on time, location, sensor data (both occupancy, daylighting and other environmental information), and manual interaction.
- B. The system shall be capable of advanced lighting control (on/off and dimming).
- C. The system shall be capable of managing packaged HVAC units capable of utilizing certified ZigBee interoperable thermostats.
- D. The system shall be capable of advanced plug load control.
- E. The system shall enable the monitoring and recording of sensor information and power measurement.
- F. All system devices shall be networked together.
- G. Control communications between devices shall be primarily achieved wirelessly.
- H. The system shall be capable of being managed and controlled remotely via a standard Web browser.
- I. The system shall be capable of creating and adjusting control zones, as granular as a single luminaire and as broad as a full facility.
- J. The system shall not require any installation of dedicated control wiring to a central controller or panel.
- K. The system shall utilize open, standardized communications between devices, and allow control devices from multiple vendors to interoperate.
- L. The system shall be capable of managing automated demand response connection and action using industry standard Open ADR elements.

1.4 WORK INCLUDED

- A. Furnish all labor, materials, tools and equipment, including incidental items required for work of this Section as shown on the drawings, specified herein, and as required for a complete and proper installation.
- B. Provider to furnish and install, a web-enabled HVAC, lighting, and landscape irrigation control and monitoring system to perform the following functions:
 - 1. Monitor all parameters necessary to provide feedback to all control, alarm and reporting functions described below.
 - 2. Control DX type HVAC systems and lighting circuits to conserve energy while maintaining required space temperature and illumination levels as described below.
 - 3. Provide 24/7/365 remote monitoring, alarming, interpretation, reporting and dispatching services for all systems monitored and/or controlled.
 - 4. Other specific functions as defined elsewhere in the specification or the drawings.

SECTION 260943 – NETWORK BUILDING CONTROL AND ENERGY MANAGEMENT SYSTEM (BMS)

- C. The system as a whole shall be installed, programmed, tested, and warranted under a single contract with the installer.
- D. The installer shall coordinate with the system vendor to connect and hand-over control to the Owner's web-based control software.

1.5 QUALITY ASSURANCE

- A. The manufacturing facility must meet ISO9001 requirements.
- B. All applicable products must be UL / CSA / FCC Listed or other acceptable testing organization.
- C. Comply with NFPA 90A.
- D. Comply with NFPA 70.
- E. Where fire alarm systems are required, coordinate equipment selection with the fire alarm system vendor and installer to achieve compatibility with equipment that interfaces with that system.
- F.

1.6 WARRANTY

- A. All devices in networked control system including the Area Controller shall have a 5 year warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The devices in the solution shall utilize certified standards-compliant ZigBee® architecture and 100% standard communication clusters. No proprietary clusters or architecture will be accepted.

2.2 SYSTEM REQUIREMENTS

- A. System shall utilize a large-scale wireless mesh network using the open ZigBee® industry standard for wireless communications to communicate between all controls devices throughout the building. All components shall utilize that standard (as written) for communications.
- B. System shall be capable of using a variety of standards-based control devices from multiple vendors. These devices shall include occupancy sensors, environmental sensors, photocell sensors, manual switches/dimmers, ballasts, LED drivers, embedded luminaires, thermostats, plug load controllers, personal handheld devices and others. Any combination of the above devices shall be possible, and all devices within the site shall be networked and accessible via a single interface.
- C. System shall be capable of controlling most standard fluorescent and LED luminaires, both separately and together as part of a single system.
- D. All system settings, controls settings, status monitoring and zone strategies shall be manageable from a standard Web-based software interface. This interface shall be accessible from any remote location with network access.
- E. Control areas shall consist of one or more intelligent control components, be capable of operation within the area, and be capable of being connected to a higher level network backbone. System shall be capable of creating and reconfiguring multiple zones within each area, or adding new devices to an existing zone, all from the software interface and without wiring.
- F. System shall be able to accommodate up to 100 devices for each area, without requiring a "bridge" device. Multiple such areas can be integrated via a higher level network backbone to build out a larger system.
- G. Devices within a control area can be installed in any order and can be flexibly assigned to zones in any combination as needed.
- H. Control areas must continue to provide control in the event of a system communication failure with the backbone network or the management software becoming unavailable.

SECTION 260943 – NETWORK BUILDING CONTROL AND ENERGY MANAGEMENT SYSTEM (BMS)

- I. System shall have a controller (the Area Controller) that manages the operation of each control area. This controller must be wall or ceiling mounted, capable of accessing and controlling wirelessly connected system devices and linking into an Ethernet network.
- J. System shall provide an energy management dashboard that displays real-time and historical energy usage data by zone.
- K. System shall be capable of operating each lighting control zone according to one of the following control strategies. The control strategies should be utilized only in a manner consistent with local energy codes.
 - 1. Auto-On / Auto-Off with
 - a. Centrally adjustable off-delay
 - b. Configurable on and off dimming levels and transition times for zones that have dimmable luminaires, enabling task tuning
 - c. Manual override timeout
 - 2. Manual-On / Auto-Off with
 - a. Centrally adjustable off-delay
 - 3. Scheduled On with
 - a. Configurable dimming level and transition times for zones that have dimmable luminaires, enabling task tuning
 - 4. Scheduled Off
 - 5. Auto-to-Override On
 - 6. Manual-to-Timed On
- L. Daylighting shall be configurable centrally. It shall be possible to enable or disable daylighting for zones with a photocell sensor, calibrate and configure the setpoint from a central location.
- M. It shall be possible to vary control strategies at different times of the day and to do so for each zone.
- N. Control profiles shall be available optionally to allow many zones to be configured to use the same control profile. This will allow rapid adjustments to the control strategy used for each zone. Control profiles shall allow specification of the control strategy, and control settings for each control strategy (such as the off-delay for an Auto-On strategy).
- O. Personal control shall be available through a web-based user interface, allowing configuration from any computer and operating system.
- P. Control software shall enable logging of power consumption, zone and space utilization (occupancy), System shall display system performance data in a web-based graphical format, and make such data available for download to .CSV, .PDF, .PNG and .SVG files.
- Q. Control software shall enable integration with a BMS via BACnet IP.
- R. System shall monitor the health and state of control devices, and provide the means to display this information, generate reports on space utilization and provide the means to notify select individuals, either through a web interface, or via emails, of important issues.
- S. System shall have a mechanism to restrict access by individual users or groups of users, by zones or by feature groups through the web user interface.
- T. System shall have a backup and restore mechanism to deal with controller and system-level component failure. This mechanism shall ensure that the system can be returned to the original state at the time of backup.
- U. System shall have an upgrade mechanism to ensure that controllers and system-level components can be upgraded. For control devices that support over-the-air wireless upgrade, the system shall provide a mechanism to upgrade the firmware of these devices.
- V. System shall be capable of managing control devices across multiple facilities and be approved to operate on the State of Tennessee IT network.
- W. System shall be capable of interfacing with MODBUS power meters, having a minimum capacity of 3 phases and an option for 24 phases per meter, to be used in conjunction with current transformers for monitoring of any load up to 5000 Amps.

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- X. System shall be capable of reading and recording pulse meter output from certified interoperable pulse devices.

2.3 NETWORK DEVICE SPECIFICATIONS**A. Area Controller (Gateway)**

1. Device shall be capable of connecting to control devices via the open ZigBee industry standard for wireless communication.
2. Device shall be powered by a standard 120V receptacle to enable flexible placement in normal spaces and optional power over Ethernet.
3. Device shall have two RJ-45 ports to enable daisy chaining of device to other area controller devices further upstream or downstream.
4. Device shall have USB ports for PC-based and USB memory stick configuration and maintenance.
5. Device shall be capable of being a DHCP client or be set to a fixed IP address.
6. The Device shall be capable of receiving automatic time updates from an internet NTP server if connected
7. Device shall be capable of managing up to 100 wireless devices and presenting them to the management software. Multiple such devices can be used to support a larger system.
8. Device shall have visual feedback (eg., LEDs) to enable rapid identification of the device's state and health.

2.4 WIRELESS DEVICE SPECIFICATIONS**A. All Wireless Devices**

1. All wireless device parameters shall be adjustable via software.
2. Devices shall be capable of communicating via an open ZigBee industry standard for its wireless communications.
3. It shall be possible to monitor battery powered devices from the control and monitoring software. Battery powered devices shall last 5 years under normal operating conditions.

B. Wireless Adapter

1. Wireless adapter shall be designed to easily connect to standard junction boxes with ¾" knockouts
2. Device shall be powered by 120-277VAC, be capable of switching 120-277VAC with loads rated to 15A and be able to measure current flow of connected loads with 2% accuracy from 30ma to 15A.
3. Device shall have 0-10VDC to control dimmable ballasts and LED drivers, with a maximum sourcing of 5mA, typically enabling control of 10 or more ballasts or drivers.
4. Device shall have 24VDC (input/output) and 0-10VDC (input) to power and control auxiliary relays, occupancy sensors, photocells but not limited to other low voltage devices.

C. Wireless Fixture Adapter

1. Wireless fixture adapter shall be designed to easily integrate into commonly available lighting fixtures for installation at the manufacturer or on site
2. Device shall be powered by 120-277VAC and be capable of switching 120-277VAC with loads rated to 2A
3. Device shall have 0-10VDC to control dimmable ballasts and LED drivers, with a maximum sourcing of 5mA, typically enabling control of a single ballast or driver
4. Device shall have 24VDC (input/output) and 0-10VDC (input) to power and control auxiliary relays, occupancy sensors, photocells but not limited to other low voltage devices.

D. Wireless General Purpose Adapter

1. Wireless general purpose adapter shall be designed to easily connect to standard junction boxes with ½" knockouts for connecting to non-lighting loads.
2. Device shall be powered by 120-277VAC and be capable of switching 120-277VAC with loads rated to 15A.
3. Device shall have a 0-10Vdc output to control general purpose actuators with a maximum sinking of 5mA
4. Devices shall have 24VDC (input/output) and 0-10VDC (input) to power and control low voltage devices including binary and analog sensors

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- E. Wireless Sensor Adapter
 - 1. Device shall be powered by 24V AC/DC
 - 2. Device shall provide (4) 10k Type 3 thermistor inputs and (2) 0-10Vdc inputs from analogue sensors
 - 3. Device shall have an internal battery backup and data storage to allow logging of thermistor data for 14 days at 5 minute intervals
- F. Wireless Occupancy Sensors
 - 1. The device shall use Passive Infra-Red (PIR) sensors to detect motion. Wall mount and ceiling mount with different range and lens angles must be available.
 - 2. The device shall be configurable as an occupancy or vacancy sensor via software.
- G. Wireless Photo Sensor
 - 1. The device shall measure light levels from 1 to 2000 lux (0.1 to 185 FC) in a 60° cone.
- H. Wireless Wall Dimmer/Switch
 - 1. Device shall provide dimming and switching depending on configuration.
 - 2. Device shall wall mount and be compatible with standard switch box mounting.
- I. Wireless Plug Load Adapter
 - 1. Wireless adapter shall be designed to easily mount to standard NEMA duplex receptacles via 3 tamper proof mounting screws using existing wall outlet cover plate holes.
 - 2. Device shall be powered by 106-127VAC and be capable of switching loads up to 15A
 - 3. Device shall be able to switch either receptacle independently and measure power consumption of connected loads.
 - 4. The device shall automatically turn off empty sockets to prevent shock
- J. Wireless Thermostat
 - 1. Device shall be compatible with the following systems:
 - a. 1 Stage Heat / 1 Stage Cool Conventional System
 - b. 2 Stage Heat / 2 Stage Cool Conventional System
 - c. 3 Stage Heat / 2 Stage Cool Conventional System
 - d. 1 Stage Heat / 1 Stage Cool Heat Pump System (without Auxiliary Heating)
 - e. 2 Stage Heat / 1 Stage Cool Heat Pump System (with Auxiliary Heating)
 - f. 2 Stage Heat / 2 Stage Cool Heat Pump System (without Auxiliary Heating)
 - g. 3 Stage Heat / 2 Stage Cool Heat Pump System (with Auxiliary Heating)
 - 2. Device shall be surfaced mounted with manual user display and interface
 - 3. Device shall conform with ZigBee standard as defined above.
 - 4. Device shall interoperate with compatible system devices.

2.5 MANAGEMENT SOFTWARE

- A. Software interface shall be made available to networked computing devices via standard Web browser, without requiring local installation on computers or other access devices.
- B. Software shall have online help that explains the use and operation.
- C. Software shall be able to connect with the system under management via LAN (local area network), WAN (wide area network) or the Internet.
- D. Software shall require that all users login with a User Name and Password and shall also support a LDAP (Lightweight Directory Access Protocol) client to authenticate users against a LDAP directory.
- E. Software shall provide at least four permission levels including System Administrator, Facility Administrator, Tenant and Individual User. Access to different parts of the application will be appropriately limited on the basis of permission levels.
- F. Software shall provide individual or group access to specific zones or collections of zones to allow flexible restriction of access.
- G. Software shall have means to enable backup and restore of all essential system state data that is required to recover from hardware failure in controllers.
- H. Software shall provide the means to commission devices, networks, zones and facilities including defining facilities, defining the network settings (eg. channel mask, network ID), adding new devices to

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the system, creating zones, creating hierarchical zone structures and assigning devices to zones, labeling devices, networks, zones and facilities.

- I. Software shall provide the flexibility to add or remove devices from zones to adjust the operational control behavior of a zone. For example adding an occupancy sensor or switch to a parent zone allows occupancy or manual control to be applied to all fixtures in all child (and descendent) zones.
- J. Software shall provide the means to commission controls including defining control profiles (commonly used control strategies and settings), control strategies (eg. OFF, ON, Auto ON/Auto OFF, Manual ON/Auto OFF, Timed ON, Auto OFF), and control settings (eg. sensor off-delay, dimming level percentage etc.).
- K. Software shall provide the means to commission controls on a schedule including varying control profiles or strategies with control settings at different times of the day for each day. This can be done for each zone independently or for groups of zones. Calendar settings shall include start and end day/hour/minute.
- L. Daylight savings time adjustments shall be performance automatically.
- M. Software shall provide an easy-to-use view of all scheduled settings across all zones.
- N. Software shall provide the means to commission daylighting set points (including daytime and night time set points) and to schedule daylight calibration to automatically at night.
- O. All control settings shall be stored on the area controller and the host server.
- P. Changes made to the operation of the system shall be done in real-time as they are applied in the software.
- Q. Software shall allow the luminaire ballast profile to be defined for each ballast model used in a facility. This ballast profile will be used to determine energy consumption at different dimming levels for greater energy consumption calculation accuracy.
- R. Software shall show cost savings, energy savings and CO2 emissions reduced, in comparison with baseline data. Baseline data shall be calculated based on opening/closing times and luminaire power consumption prior to a controls upgrade.
- S. Software shall provide inputs for variable energy rates including at least four time of day rates as well as winter and summer rates for calculation of baseline and current energy use.
- T. Software shall show a dashboard summarizing the state and health of the system, utilization of the lights, the current state of demand-response, and the facility and user-selectable zone energy usage on a daily, weekly, monthly or annual basis. The data shall be presented graphically on screen and available for print or export to .CSV, .PDF, .PNG and .SVG formats.
- U. Software shall show a list of all zones, their location within the facility, any active alarms associated with each zone, their active control profile or control strategy, the state of the zone (eg., occupied/vacant, dim level) and the devices within the zone.
- V. Software shall allow manual operations of each zone including on/off and dimming control or device identification (blink identification).
- W. Software shall provide a floor plan view allowing floor plans to be uploaded as .JPEG, .PNG, .BMP or .GIF formats. Zones can be placed on floor plan to show the current state including the current dimming light level and occupancy state, the control setting and strategy and the current energy consumption. Multiple floor plans can be uploaded per facility.
- X. Energy comparison, usage, savings, zone utilization and facility utilization reports shall be available displayed on a user friendly graphical display, exportable to .CSV and printable.
- Y. Reports shall be available per zone, per facility and custom user specified.
- Z. Reports shall have user-definable timescale and timeframe (hourly, daily, monthly, and annually).
- AA. Energy comparison, usage and savings reports shall be available in kWh, \$, CO2 emissions and percentages.
- BB. Energy and zone usage reports shall be available with minimum, average and maximum values.

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- CC. Zone utilization reports shall be made available for minutes occupied, average zone light level and manual overrides. Facility utilizations shall be made available for minutes occupied, percent occupancy and load utilization as a percentage.
- DD. Software shall show, for all devices: device ID, model, location, wattage, last alarm associated with the device, zone membership, area controller associated with the device and the last event (with time of occurrence) associated with the device (eg., switched on/off, occupied/vacant, light level detected, depending on device type). The list of information provided shall be user customizable.
- EE. Software shall allow on/off flash device identification.
- FF. Software shall provide all events and alarms for devices, facilities, schedules, area controllers and zones providing information on the state and any alterations made within the system.
- GG. Software shall allow events and alarms to be filtered by severity and sorted by timeframe, type, category, classification, area controller, zone or device.
- HH. Software shall allow notification of events and alarms to be presented through the web user interface or via email notification. Software shall provide the means to configure the mail server settings, and to create rules (eg. send emails whenever an event occurs or configuration change).
- II. Software shall allow interfacing of controls with demand-response programs, and in particular, use the OpenADR v1.0 and 2.0 protocol.
- JJ. Software shall allow specification of control strategy for the three demand-response severity levels (moderate, high and very high). Control strategies can be changed to turn lights off, to reduce the current light level by a specified dimming level percentage (with an optional minimum level requirement for safety), or to set the light level to a specified dimming level percentage. The off-delay can also be adjusted as part of the response to the demand-response severity level.
- KK. Software shall allow the adjustment of the control strategy and control setting for any zone independently, or multiple zones or all zones collectively.

2.6 BMS COMPATIBILITY

- A. System shall incorporate a RESTful API as an optional feature capable of live data interface with other systems.
- B. System API will utilize the Project Haystack data mapping standard to identify points of information.

2.7 MONITORING – STATUS, CONDITION AND VALUE

- A. The following points will be monitored or calculated from monitored points:

Supply Temperature	Limit Control Status	Cool Recovery Time, Stage 1
Return / Space Temperature	Limit Cycle Period	Cool Recovery Time, Stage 2
Ambient Temperature	Limit Off Period	Heat Recovery Time, Stage 1
Space Relative Humidity	Temperature In Celsius	Heat Recovery Time, Stage 2
Compressor Suction Temperature, Stage 1 & 2	Setback Control Status	Avg. Daily Compressor Cooling Kw, Stage 1
Outdoor Coil Liquid Temperature, Stage 1 & 2	Cool/Heat Call Status	Avg. Daily Compressor Cooling Kw, Stage 2
Indoor fan current - A phase	HVAC Unit Short Cycling	Avg. Daily Compressor Heating kW, Stage 1
Indoor fan current - B phase	Hourly Return Air Temp	Avg. Daily Compressor Amps, Stage 1 - A Phase
Indoor fan current - C phase	Hourly Ambient Air Temp	Avg. Daily Compressor Amps, Stage 1 - B Phase
Compressor Current - A phase	Hourly Space Relative Humidity	Avg. Daily Compressor Amps, Stage 1 - C Phase
Compressor Current - B phase	Hourly Supply Air Temperature	Avg. Daily Compressor Amps, Stage 2 - A Phase
Compressor Current - C phase	Day of Week	Avg. Daily Compressor Amps, Stage 2 - B Phase

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System Voltage - A phase	Setback Override Time	Avg. Daily Compressor Amps, Stage 2 - C Phase
System Voltage - B phase	Space Temperature	Avg. Daily ID Fan Amps, A Phase
System Voltage - C phase	Indoor Fan Power	Avg. Daily ID Fan Amps, B Phase
15 Min Indoor Fan Amps	Setback Override Enable	Avg. Daily ID Fan Amps, C Phase
15 Min Compressor Amps	7-Day Setback Temperatures	Hourly Total kWh
15 Min Indoor Fan KW	Hourly Heating Runtime	Daily Total Cooling Runtime, Stage 1
15 Min Compressor KW, Cooling	HVAC Call Reset	Daily Total Cooling Runtime, Stage 2
Indoor Fan KWh	Unit Cycles, Stage 1	Daily total Heating Runtime, Stage 1
Compressor KWh	Expected Indoor Fan Power	Daily total Heating Runtime, Stage 2
Indoor Fan Run Time	Temperature Limiting Deadband	Average Daily Compressor Suction Temperature
Compressor Run Time, Cooling	Lighting Relay State Notification	Average Daily Compressor Discharge Temperature
Micro State	Expected Cooling Split, Stage 1	Daily ID Fan Runtime in Setback
Test Mode Status	Expected Heating Split, Stage 1	Daily Cooling Runtime, Stage 1 in Setback
Test ER Status	Low Ambient Compressor Lockout Enable	Daily Cooling Runtime, Stage 2 in Setback
Test Runtime	Expected Heating Split, Stage 2	Daily Heating Compressor Runtime, Stage 1 in Setback
Cooling Call Time, Stage 1	Heating Run Time	Daily Heating Compressor Runtime, Stage 2 in Setback
Cooling Call Time, Stage 2	Indoor Fan KWh, Heating	Daily Heating Gas Valve Runtime, Stage 1 in Setback
HP Defrost Time	Indoor Fan KWh, Cooling	Daily Heating Gas Valve Runtime, Stage 2 in Setback
ER Status	Compressor KWh, Heating	Daily ID Fan kWh in Setback
Heating Call Time, Stage 1	Setback Override	Daily Compressor Cooling kWh in Setback
Heating Call Time, Stage 2	Setback Settings	Daily Compressor Heating kWh in Setback
Circuit Relay Operation (Normal/Pulse)	Daily KWh, Override	Daily Avg. Ambient Temperature in Setback
Cooling Recovery Time, Stage 1	Daily Gas Run Time, Override	Daily Avg. Ambient Temperature Outside Setback
Cooling Recovery Time, Stage 2	Low Heating Split Temp Alarm, Stage 2	Daily Avg. Space Return Temperature in Setback
Heating Recovery Time, Stage 1	Low Compressor Suction Alarm Compressor Off Time	Daily Avg. Space Return Temperature Outside Setback
Heating Recovery Time, Stage 2	Low Compressor Suction Alarm Enable	HVAC Loss of AC Power Alarm Trigger Period
Heater Type	Board Power Up	HVAC Loss of AC Power Alarm Enable
Humidity Check Status	Avg. Daily Cooling Split, Stage 1	HVAC Loss of AC Power Alarm
Temperature Limiting Status	Avg. Daily Cooling Split, Stage 2	7 day Setback Schedule
Heat Max Temp	Avg. Daily Heating Split, Stage 1	
Cool Min Temp		

CHASE

SECTION 260943 – NETWORK BUILDING CONTROL AND ENERGY MANAGEMENT SYSTEM (BMS)

2.8 MONITORING – ALARM CONDITION.

- A. At a minimum, the following points will be alarmed (alarm parameters to be adjustable to be customized for client's needs):

Alarm Description	Unit	Alarm Purpose & Example
Air Filter Condition	Percent	To optimize filter changes based on avg volt X amp draw at blower motor, e.g. at 60% of filter capacity; saves energy and filter costs
Low Cooling Temp, Stage 1, & Stages 1 & 2	Deg F	To indicate inefficient cooling based on temp difference between return and supply air, compared to baseline avg daily delta T
Low Heating Temp	Deg F	To indicate inefficient heating based on temp difference between return and supply air, compared to baseline avg daily delta T
Equipment Lockout	Heat/Cool	Unit not responding to call for heat or cooling from T'stat
System Short Cycling	Cycles/period	If cycles/period exceeds set point; indicates inefficient cooling
Indoor Fan Inoperative	On/Off	Fan not operating on call for heat or cool or start/stop schedule, based on amps measured at indoor fan motor
Low Compressor Suction Temperature	Deg F	When thermistor on the compressor refrigerant suction line measures 30°F or less; indicates compressor malfunction
Space Temperature	Deg F	When space temp strays beyond setting and dead band for occupied and unoccupied modes, indicating loss of control; saves energy
Space Relative Humidity	Percent	When the return air relative humidity approaches 60% , the system disables the recovery cycle to allow the HVAC unit to keep cooling to reduce high humidity levels in the space.

2.9 CONTROL OF HVAC EQUIPMENT

- A. The System shall track system component operational data and, using a wireless communication protocol, transmit the data to a dedicated remote server. The acquired data will be reformatted for Web access on a website with a dedicated address for the client's sites, and a dedicated points list for each DX unit at each site. For HVAC control, the System will be installed between the native thermostat and the corresponding HVAC unit, and will filter the existing thermostat heating and cooling calls. This filter will provide three methods of improved energy performance:
1. Temperature Limiting: Utilizing 0.5 degree sensitive thermistors, the System will enable precise setting of both lower cooling limits and upper heating limits.
 2. System Setback: The System will enable HVAC unit run times. Set back operation schedules will be maintained and verified by Web accessible inputs.
 3. Refrigeration Cycle Optimization: The System software will anticipate the rate at which space conditions are satisfied, ensuring optimal thermodynamic efficiency of the HVAC unit's refrigerant cycle.
- B. In addition, System shall be capable of performing duty cycling of direct expansion (DX) compressors remotely.

2.10 CONTROL OF LIGHTING EQUIPMENT

- A. The System shall be connected to lighting panel contactors and deployed to maintaining a verifiable lighting operating schedule. A minimum of four (4) lighting circuits shall be controllable by a single controlling unit, and shall have two spare points to capture site kWh consumption at the utility service.
- B. The lighting control must be compatible with both momentary and maintained relay output contacts for integration of control with pulse operated and maintained lighting contactor panels.

SECTION 260943 – NETWORK BUILDING CONTROL AND ENERGY MANAGEMENT SYSTEM (BMS)

- C. The controller must provide local override control of the lighting schedules to allow the occupants to turn the lights on for a predetermined duration during scheduled off time periods.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wireless devices will not require any wiring between them (although some may require local wiring).
- B. Area controllers shall be networked via standard Ethernet (LAN or WAN) for commissioning.
- C. All wireless devices shall attempt to join control network when initially powered.
- D. Once the software is installed the system shall allow all wireless devices to join the system and auto-discover all devices without requiring commissioning.
- E. Once devices are associated to zones and zones to area controllers the software shall automatically determine and adjust membership of wireless devices to area controllers (or wireless networks) without requiring commissioning.
- F. All system devices shall be capable of being given user-defined names and assigned to any zone within the system.
- G. Upgrade via software shall be supported for control devices that support over the air updates.
- H. All control devices shall have LEDs providing device status including normal operation and improperly configured.
- I. All control devices shall have means to restore to factory-defaults.
- J. Wireless adapters shall have self-test mode for verification of correct wiring to wired devices, including occupancy sensors photocells, ballasts and drivers.

3.2 ELECTRICAL WIRING AND CONNECTIONS

- A. Provide and install HVAC control wiring in accordance with Section 260519 – Low Voltage Conductors and Cables.
- B. Install all HVAC control wiring within a complete grounded conduit system according Sections 260526 – Grounding for Electrical Systems, 260531 – Conduits, 260532 – Boxes For Electrical Systems, and 260533 – Pull and Junction Boxes.

END OF SECTION

CHASE
SECTION 262001 - LOW-VOLTAGE ELECTRICAL DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for construction, A.I.A. A201, Latest Edition, and the Supplementary General Conditions are a part of the Contract for this work. Contractor shall consult them and the General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the Drawings applying to this work are also a part of this Section.

1.2 WORK INCLUDED

- A. The work under this section of the specifications includes the furnishing of all labor, equipment, material and performing all operations for the connection and installation of all distribution systems as shown on the drawings and hereinafter specified.

1.3 SUBMITTALS

- A. Shop Drawings for all distribution equipment shall be submitted for approval.
- B. Shop Drawing shall include the following:
 - 1. Panelboards.
 - 2. Dimensions.
 - 3. Material and construction.
 - 4. Contactors and relays.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Panelboards shall be dead front, dead rear flush-mounted or surface-mounted as noted on the drawings with main circuit breaker, main lugs and branch circuit breakers as shown on panel schedule, hinged, lockable doors, typewritten index card-holders, proper bussing and main lugs, double lugs or main breakers as required. Lugs shall be sized for feeders.
- B. Busses shall be copper, full panel height, and shall be rigidly supported with bus supports and all phase busses shall be identified. Solderless, silver-plated lugs shall be provided for all required cable connections. Minimum bus rating shall be as large as the setting of the feeder protective devices. Incoming service panelboard shall be service entrance labeled and braced for a minimum interrupting capacity of 42,000 amps RMS. Actual available short-circuit current to be coordinated with utility company and adjusted accordingly.
- C. Provide oversize gutters for feed-through, where indicated or required. Where double lugs are not permitted by local code, provide suitable pull box or gutter adjacent to panels for connections.
- D. All panelboards shall have flush catch and corbin lock and shall be keyed to operate from one key.
- E. Panelboard trim and door shall be finished shop prime where exposed to public view (e.g., corridors, offices, etc.) and hammertone gray in equipment rooms.
- F. Panelboards (other than the service entrance panelboard) shall incorporate circuit breakers with a minimum interrupting rating of 10,000 AMP RMS.
- G. Lighting Panel. Shall have galvanized cabinets with a minimum width of 20". Rating shall be of the voltage, phase and number of wires as indicated on schedules and panel shall have a solid neutral bar.
- H. Circuit Breakers. Shall be automatic, molded case, trip-free, quick-make, quick-break, thermal-magnetic type, bolted to the bus, with handles clearly indicating tripped position. Breaker handles shall indicate size. Breakers shall be of size and arrangements as shown on schedules. Multiple breakers shall have common internal trip. Breakers shall be sequenced phased with odd numbers on the left and even numbers on the right.

CHASE

SECTION 262001 - LOW-VOLTAGE ELECTRICAL DISTRIBUTION

- I. Panelboards shall be as manufactured by Cutler Hammer, GE, ITE, Square D, or Westinghouse.

PART 3 - EXECUTION (Not used)

END OF SECTION

CHASE
SECTION 262813 - FUSES

PART 1 - GENERAL

- A. Submittals: Submit product data according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Comply with NFPA 70 "National Electrical Code" for components and installation.
- C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

- A. Cartridge Fuses: NEMA FU 1 nonrenewable cartridge fuse, class as specified or indicated, current rating as indicated, voltage rating consistent with circuit voltage.
 - 1. Motor Branch Circuits: Class RK1 time delay.
 - 2. Other Branch Circuits: Class RK5 non-time delay.

PART 3 - EXECUTION

- A. Install fuses in fusible devices as required. Arrange fuses so that fuse ratings are readable without removing fuse.
- B. Install typewritten labels on the inside door of each fused switch to indicate fuse replacement information.

END OF SECTION

CHASE
SECTION 262819 - DISCONNECTS (MOTOR AND CIRCUIT)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, A.I.A. A201, Latest Edition, and the Supplementary General conditions are a part of the Contract for this work. Contractor shall consult them and the General Requirements, Division 1, for instructions pertaining to work under this Section. All notes on the Drawings applying to this work are also a part of this Section.

1.2 WORK INCLUDED

- A. Provide disconnect switches for motors or circuits where indicated on the Drawings, specified herein and as required for a complete and proper installation.

1.3 RELATED WORK

- A. Related work not covered by this Section includes, but is not necessarily limited to the following: See Section 260500 - Common Work Results for Electrical.

1.4 QUALITY ASSURANCE

- A. Disconnect switches shall bear the label of the Underwriter's Laboratories, Inc., and shall be sized in accordance with the N.E.C.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Disconnect switches shall be:
 - 1. Heavy duty, quick-make and quick load break.
 - 2. Switches shall have NEMA Type 1 enclosures except in areas where environmental conditions are not suitable in which case suitable enclosures of the NEMA type required shall be installed.
 - 3. Switches shall have defeatable door interlocks that prevent the door from opening when the handle is in the "On Position".
 - 4. Lock-open padlock provisions and indication of on/off positions on the door.

2.2 MANUFACTURERS

- A. Disconnect switches shall be Cutler-Hammer, G.E., Siemens, Square D or Westinghouse.

PART 3 - EXECUTION (Not used)

END OF SECTION

CHASE
SECTION 265000 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, A.I.A. A201, Latest Edition, and the Supplementary General Conditions are a part of the Contract for this work. Contractor shall consult them and the General Requirements, Division 1, for instructions pertaining to work under this section. All notes on the drawings applying to this work are also a part of this Section.

1.2 WORK INCLUDED

- A. Furnishing and installing lighting fixtures, with lamps, trims, extension trims, collars, hangers, supports and controls as required for a complete and proper installation.
- B. The Electrical Contractor shall refer to the Architectural Room Finish Schedules and Architectural and Structural details to determine conditions and finishes affecting the installation of this work; and he shall include all items of labor and materials necessary or required for adjustment of fixtures due to surrounding finished construction.
- C. All lighting fixtures shall be ordered and installed based on both the "Lighting Fixture Schedule" and the electrical drawings and the architect's "Reflected Ceiling Plan". See Reflected Ceiling Plan for location, type and thickness of ceiling material.
- D. Contractor to coordinate for proper application of IC rated and non-IC rated recessed fixtures for each area prior to ordering fixtures.
- E. Contractor to provide appropriate enclosure around fixtures when required to comply with local and/or national code requirements.
- F. Contractor to provide appropriate ceiling thickness and adaptors as required for proper installation of recessed light fixtures and trim.

1.3 RELATED WORK

- A. Related work not covered by this Section includes, but is not necessarily limited to, all sections 260013 through 262819.

1.4 SUBMITTALS

- A. Shop drawings for all lighting fixtures and controls shall be submitted for approval. Comply with pertinent provisions of Division 1.
- B. Shop drawings shall include the following data:
 - 1. Catalog data: Manufacturer's literature and illustrations.
 - 2. Dimensions.
 - 3. Materials and construction.
 - 4. Ballast data.
 - 5. Lamp data.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lighting fixtures are identified on the Drawings by type letters adjacent to the symbol on the Plan, or by area location on the Fixture - Schedule. Fixtures are identified in the foregoing and Designated by manufacturer's number on the Fixture Schedule and Drawings. Color and finishes to be as specified in the Fixture Schedule.
- B. All fixtures shall comply with the rules and regulations of the National Electrical Code. Any material required in connection with the installation of all fixtures in a rigid and efficient manner shall be furnished and installed whether or not same is specifically mentioned herein. Wiring for final connection shall be minimum #14 solid type THHN wire. All fixtures shall bear Underwriters' Laboratories labels.

CHASE
SECTION 265000 - LIGHTING

- C. All fluorescent fixtures shall be provided with electronic ballasts of proper wattage, and voltage rating, high power factor Type "A" sound rating and ETL/CBM approval. Ballast to incorporate all Type "P", internal protection. All 32 Watt R.S. ballasts shall be as manufactured by G.E., Advance or Universal.
- D. Lamps: All lamps shall be furnished and installed by this Contractor, unless otherwise indicated in the Light Fixture Schedule in the Drawings.

PART 3 - EXECUTION

- A. Fixture Types: The Contractor shall furnish the various types of fixtures as indicated in the Fixture Schedule on the Drawings. See Fixture Schedule for fixtures furnished by this contractor. All fixtures shall be located to suit the Architectural details of the areas involved.
- B. Recessed Fixture Installation: Recessed fixtures shall be of type suitable for mounting in the type of ceiling as scheduled on the Drawings. Variations to catalog numbers indicated shall be made to assure proper mounting and fitting arrangements, prior to fabrication.
- C. Supports:
 - 1. Each lighting fixture shall be rigidly supported from the building construction, and the Electrical Contractor shall be responsible for providing suspension hangers, stems and extra steel work for fixture support where required.
 - 2. Electrical Contractor shall confer with Ceiling Contractor to determine modifications required to make fixtures suitable for ceiling as installed.
 - 3. Where recessed fixtures are called for, each shall be provided with the proper plaster frame or suitable adapter to receive the finished ceiling construction.
 - 4. Where suspended acoustical tile ceilings on steel channels occur, outlets and fixtures shall be supported on members resting on the channel framework. In no case shall fixtures be supported from plaster or acoustic material.
 - 5. Suspended fixtures shall be hung on suspension hangers furnished by the fixture manufacturer and shall be adjusted as necessary during installation to insure that all fixtures in the same room or area are at uniform height from the floor. Mounting height shall be as specified, detailed or noted on the Drawings. Any electrical lighting fixture that weighs more than 50 lbs shall be supported independently of the outlet box.
- D. Fixture Wiring:
 - 1. Fixtures shall be wired with white wire for the neutral and color wire for phase wires; See Section 260519 (Low-Voltage Electrical Power Conductors and Cables.)
 - 2. Housing of all fixtures must be grounded to conduit system.
 - 3. BMS System wireless control adapters shall be installed mounted directly to individual fixtures, mounted to a junction box ahead of a parallel-wired group of fixtures, or at a fixture circuit contactor or relay, as indicated in the drawings.
 - 4. Each fixture to be complete with holders, screws, sockets, wires, lamps, etc., as is necessary for a complete installation.
 - 5. Fluorescent lighting shall be wired as circuited on the Plan Drawings.
- E. Operation and Controls:
 - 1. Local switches as shown and wired.
 - 2. Wireless controls and adapters as indicated on the drawings.
 - 3. Panel switched lighting as indicated on Drawings.
 - 4. Emergency lighting for egress purposes shall be provided.
 - 5. Momentary contact switches as indicated on the drawings.
 - 6. Exit and directional signs shall be provided. Provide battery operated exit and directional signs where shown.
 - 7. Provide emergency and exit lighting systems as required to conform to Code. Emergency and exit lighting shall be provided on separate circuits where required.

END OF SECTION

CHASE
SECTION 271213 - TELEPHONE CONDUIT SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section generally describes the work and equipment required to furnish and install a complete telephone conduit system with power requirements, boxes, pull tapes, terminal cabinets, plywood terminal boards, in accordance with these specifications. All telephone equipment shall be furnished and installed by others.

1.2 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. NFPA 70-NEC.
 - 2. Telephone company standards.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All outlet boxes, conduits, pull tapes, cover plates, power supplies grounding shall be in accordance with these specifications and the applicable sections of Divisions 26 and 27, and referenced in Divisions of the Work.
- B. Conduit (all systems):
 - 1. Service conduits shall be rigid steel concrete encased and steel reinforced through the foundation wall and for at least ten feet outside the wall. Refer to Section 16111 "Conduits" for further requirements.
 - 2. Distribution conduits shall be thin wall. Minimum of 3/4-inch conduit to each outlet.
- C. Outlet boxes shall be standard size with mud rings for wall type.
- D. Cover plates (refer to Section 260534) with 5/8" bushed opening.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide (2) 4" underground telephone service conduits with pull wire line (or utility easement and/or phone box) to data room in building.
- B. Furnish and install all conduit, outlet boxes, cabinets, plywood required for the installation and operation of a complete telephone system as shown on the Drawings.
- C. All power wiring for each system shall be of the same type as required for power wiring, and shall meet all the requirements of national, state and local electric codes.
- D. Provide a 3/4" conduit with ground wire to the building ground and to a water pipe from main telephone terminal plywood. Furnish two 120-volt quadplex receptacles connected to a separate 20 amp - single-phase circuit adjacent to the main telephone entrance.
- E. Coordinate all work with the telephone/communications installing contractor, architect and/or owners representative prior to rough in.
- F. Contact the local utility and/or telephone company to coordinate the exact telephone service entrance location and requirements prior to running conduits.
- G. Furnish and install complete all conduits, boxes, fittings, supports, pull wires, etc. for all telephone/communications/data outlets indicated on the drawings and as required for a complete operating system.

CHASE
SECTION 271213 - TELEPHONE CONDUIT SYSTEM

- H. Provide an 8'x8'x3/4" fire rated plywood telephone board. Also provide ground bus on board and a #6 AWG isolated ground to service entrance ground rod.

END OF SECTION

CHASE
SECTION 312200 - GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading the site for site structures, building pads, and paved areas.
- C. Finish grading.

1.2 RELATED SECTIONS

- A. Section 015713 – Temporary Erosion and Sedimentation Control.

1.3 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Topsoil excavated on-site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.

3.3 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 SOIL REMOVAL

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Stockpile subsoil to be re-used on site; remove remainder from site.

CHASE
SECTION 312200 - GRADING

- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion. See Section 015713 for Rules for Stockpile.

3.5 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Place topsoil in areas indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to thickness as scheduled.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants spread topsoil manually to prevent damage.
- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.

3.6 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.7 CLEANING AND PROTECTION

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

CHASE
SECTION 320190 - MAINTENANCE OF PLANTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Maintain plants in manner that promotes health, growth, color and appearance, to quality levels specified; replace dead, dying, and damaged plants at no extra cost to Owner.
- B. Maintain newly planted landscape plants, including turf (lawns), trees, shrubs, ground cover, perennials, flowering bulbs, and annuals.
- C. Maintenance Period: The time frame covered by these requirements is:
 - 1. Time Frame: From date of installation until date of turnover or 14 days from installation, whichever is longer.

1.2 RELATED REQUIREMENTS

- A. 015713 – Temporary Erosion and Sediment Control
- B. 312200 – Grading.

1.3 REFERENCE STANDARDS

- A. ANSI A300 Part 1 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices; 2001.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 LANDSCAPE MAINTENANCE - GENERAL

- A. Protect existing vegetation, pavements, and facilities from damage due to maintenance activities; restore damaged items to original condition or replace, at no extra cost to Owner.
- B. Keep all dirt areas free from weeds during construction, and after landscaping is complete until date of turnover.
- C. Watering, Soil Erosion, and Sedimentation Control: Comply with federal, state, local, and other regulations in force; prevent over-watering, run-off, erosion, puddling, and ponding.
 - 1. Repair temporary erosion control mechanisms provided by others.
 - 2. Repair eroded areas and replant, when caused by inadequate maintenance.
 - 3. Prevent sediment from entering storm drains.
- D. Trees: Exercise care to avoid girdling trees; provide protective collars if necessary; remove protective collars at end of maintenance period.
- E. Drainage Channels: Remove obstructions in gutters, catch basins, storm drain inlets, yard drains, swales, ditches, and overflows.
 - 1. Remove grates from catch basins to clean.
 - 2. Prevent encroachment of other vegetation on turfed surface drainage channels.
- F. Replanting: Perform replacement and replanting immediately upon removal of dead plant.

3.2 IRRIGATION

- A. Irrigation: Do not allow plants to wilt; apply water as required to supplement rainfall; do not waste water; do not water plants or areas not needing water; do not water during rainfall; shut off water flow when finished; repair leaks.
 - 1. No automatic irrigation system is available; provide hoses and other equipment as required.
 - 2. Do not drive water trucks over turf, seeded areas, or planting beds.
 - 3. Provide backflow preventers on hose bibbs used for irrigation hoses.

SECTION 320190 - MAINTENANCE OF PLANTING

3.3 TURF MAINTENANCE

- A. Maintain turf in manner required to produce turf that is healthy, uniform in color and leaf texture, and free from weeds and other undesirable growth.
- B. Mowing: During growing season(s) mow turf to uniform height, in manner that prevents scalping, rutting, bruising, and uneven or rough cutting.
 - 1. Prior to mowing clean all debris and leaves from turf surface.
 - 2. Schedule frequency of mowing so that no more than one-quarter to one-third of grass leaf length is removed during a cutting.
 - 3. Make each successive mowing at approximately 45 degrees to the previous mowing, if practical.
 - 4. Cool Season Grasses:
 - a. Reduce mowing height in fall and spring.
 - b. Use rotary type mowers; mulcher type mowers may be used.
 - 5. Warm Season Grasses:
 - a. Increase mowing height slightly as fall approaches.
 - b. Use reel type mowers; do not use mulcher mowers.
- C. Trimming: Immediately after each mowing, neatly trim perimeter of each turf area and around obstructions within turf area; match height and appearance of adjacent turf.
 - 1. Adjacent to Pavements: Cut edges of turf to form a distinct, uniform turf edge.
 - 2. Adjacent to Planting Beds and Permanently Mulched Areas: Cut edges of turf to form a distinct, uniform turf edge.
 - 3. Around Other Trees and Poles: Where no planting bed or mulched area exists, trimming with string trimmer is acceptable.
 - 4. At Fences: Trim on both sides of fence.
 - 5. Irrigation Heads and Valve Boxes: Trim neatly so grass doesn't interfere with operation.

3.4 PLANTING BED MAINTENANCE

- A. Planting beds include all planted areas except turf.
- B. Begin maintenance immediately after plants have been installed; inspect at least once a week and perform needed maintenance promptly.

3.5 TREE AND SHRUB MAINTENANCE

- A. Trees will be considered dead when main leader has died back or when 25 percent or more of crown has died.
- B. Shrubs will be considered dead when 25 percent or more of plant has died.
- C. Adjust stakes, guys and turnbuckles, ties, and trunk wrap as required to promote growth and avoid girdling.

3.6 CLOSEOUT ACTIVITIES

- A. 2 days prior to end of maintenance period, submit request for final inspection.
- B. Final inspection will be conducted by Owner.

END OF SECTION

CHASE
SECTION 321123 – AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes furnishing and placing one or more courses of aggregate base on a prepared surface for concrete sidewalks, stair steps, integral curbs, gutters, parking areas, and roads.
- B. Subgrade preparation.

1.2 RELATED SECTIONS

- A. 013564 – Green Requirement Summary.
- B. 033000 – Cast-in-Place Concrete.
- C. 079200 – Joint Sealants: Sealant for joints.
- D. 099000 – Paints and Coatings: Pavement markings.
- E. 321216 – Asphalt Paving
- F. 321313 – Portland Cement Concrete Paving
- G. 211413 – Unit Paving

1.3 REFERENCES

- A. AASHTO: American Association of State Highway and Transportation Officials
 - 1. AASHTO T027: Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - 2. AASHTO T096: Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - 3. AASHTO T176: Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
- B. ASTM: American Society for Testing and Materials
 - 1. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 2. ASTM D2041: Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
 - 3. ASTM D2419: Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
 - 4. ASTM D2922: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- C. [State or local authority having jurisdiction for specification of aggregate base courses and subgrade preparation]
- D. WAQTC: Western Alliance for Quality Transportation Construction
 - 1. WAQTC TM-1: Determining the Percentage of Fracture in Coarse Aggregate

1.4 DEFINITIONS

- A. Maximum Density Test (MDT): Theoretical maximum density of the bituminous mixture determined by multiplying the theoretical maximum specific gravity, determined by ASTM D2041, by 62.4 pounds per cubic foot.
- B. Moving Average Maximum Density (MAMD): A moving five-test average of the most recent MDT's. The moving average starts with the theoretical maximum density determined during the mix design. The mix design density is included in the average until five MDT's have been completed.

1.5 SUBMITTALS

- A. Submit aggregate qualification reports and tests for approval by Engineer of Record in accordance with [standard of authority having jurisdiction] for aggregate used in aggregate base.
 - 1. Gradation reports.
 - 2. Compaction tests.

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SECTION 321123 – AGGREGATE BASE COURSES

1.6 QUALITY ASSURANCE

- A. Furnish material from a single source throughout the course of the work.
- B. Compaction test(s) shall be conducted by an independent testing laboratory.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store aggregate base material on-site covered or in a location where material will not be contaminated.

1.8 SITE CONDITIONS

- A. Unfavorable Weather: When weather is such that satisfactory results cannot be secured, suspend operations until the weather is considered favorable.
- B. Wet Subgrades: Do not place material on wet or muddy subgrade.

1.9 WARRANTY

- A. Warrant Work for a period of one year from the Date of Final Completion against defects in materials and workmanship.
- B. Additional Items Covered: Warranty shall also cover repair of damage to other materials and workmanship resulting from defects in materials and workmanship.

PART 2 - MATERIAL

2.1 AGGREGATE

- A. Aggregate base course(s) shall consist of crushed gravel or crushed stone, conforming to the quality requirements of AASHHTO T 027. The aggregate shall be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound.
- B. Base course material shall conform to one of the following gradations as specified in the drawings:

BASE COURSE GRADATIONS (Percent passing by weight)			
Sieve Design	TBD	TBD	TBD
4	TBD	TBD	TBD
2	TBD	TBD	TBD
1 1/2	TBD	TBD	TBD
1	TBD	TBD	TBD
3/4	TBD	TBD	TBD
3/8	TBD	TBD	TBD
No. 4	TBD	TBD	TBD
No. 10	TBD	TBD	TBD
No.40	TBD	TBD	TBD
No.200	TBD	TBD	TBD

- C. [Specify additional technical requirements as necessary.]

2.2 EQUIPMENT

- A. Furnish all necessary equipment for production, stockpiling, moisture conditioning, and hauling aggregate, preparing the surface on which the aggregate base will be placed, and placing, spreading,

CHASE
SECTION 321123 – AGGREGATE BASE COURSES

compacting, finishing and maintaining the aggregate base per the Engineer of Record's requirements as outlined in the Drawings.

- B. Perform blending and mixing of aggregates and adjustment of moisture content as required for compaction in a central mixing plant.
- C. Place and spread the blended and mixed aggregates to the width and thickness specified using approved mechanical spreading equipment. Do not use motor graders for spreading.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

- A. Meet requirements of Project Geotechnical Report recommendations for subgrade preparation prior to placement of aggregate base or cement-treated base.
- B. Grade subgrade with uniform slope between points where elevations are given.
- C. Use equipment of proper size and appropriate type to achieve grades required.
- D. Grade subgrade surface to within 0.05-foot (15 mm) of elevations indicated by the Drawing details.
- E. Fill and compact any depressions and remove loose material to finish true to line and grade, presenting a smooth, compacted and unyielding surface, except where indicated otherwise.
- F. Remove debris, loose dirt and other extraneous materials.

3.2 PLACEMENT, AND SPREADING, and COMPACTION OF AGGREGATE

- A. Hauling:
 - 1. Transport the aggregate to the work site, add water to obtain proper moisture content, and place on the prepared surface or material by means acceptable to the authority having jurisdiction.
 - 2. Use of dragline equipment to transport aggregate from stockpiles to elevators or other loading devices will not be permitted.
 - 3. Distribute hauling over the area to be paved in such a manner as to be most effective in the compacting of the surfacing.
 - 4. Hauling over any of the surfacing in process of construction will not be permitted when, in the opinion of the University, the effect will be detrimental.
 - 5. Uniformly load hauling vehicles when it is practicable.
- B. Thickness and Number of Layers:
 - 1. Base: If the required compacted depth of the base course exceeds 6 inches, construct it in two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.
 - 2. Place each layer in spreads as wide as practical and to the full width of the course before a succeeding layer is placed.
- C. Compacting and Shaping:
 - 1. Obtain the Engineer of Record's acceptance of the foundation layer for aggregate base course before beginning construction of the aggregate base course.
 - 2. Compact each layer of material placed in shoulder and base areas by rollers. Produce a uniform texture and firmly key the aggregates. Apply water over the materials for proper compaction according to these specifications. Continue compaction until there is no reaction or yielding observed under the compactor.
 - 3. Compact each lift to a minimum of 95 percent of maximum dry density as determined by ASTM D1557.
 - 4. Density of in-place compacted aggregate base course will be measured in accordance with ASTM D2922.
- D. Surface Tolerance:
 - 1. The finished top of base course, when tested with a Contractor-furnished 12-foot straightedge, shall not vary from the testing edge by more than 0.04 foot at any point, and shall be within 0.04 foot of specified grade.

CHASE
SECTION 321123 – AGGREGATE BASE COURSES

END OF SECTION

CHASE
SECTION 321313 - PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete sidewalks, stair steps, integral curbs, gutters, parking areas, and roads.

1.2 RELATED SECTIONS

- A. 013564 – Green Requirement Summary
- B. 033000 – Cast-in-Place Concrete.
- C. 079200 – Joint Sealants: Sealant for joints.
- D. 099000 – Paints and Coatings: Pavement markings.

1.3 REFERENCES

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.
- E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988 (Reapproved 2002).
- F. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2006.
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2007.
- H. ASTM C33 - Standard Specification for Concrete Aggregates; 2003.
- I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2005.
- J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2007.
- K. ASTM C150 - Standard Specification for Portland Cement; 2005.
- L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2001.
- M. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.
- N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2005a.
- O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types); 2004.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.
- C. Samples: Submit samples of underslab vapor retarder to be used.
- D. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

CHASE
SECTION 321313 - PORTLAND CEMENT CONCRETE PAVING

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Form Materials: Conform to ACI 301.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751); thickness 1/2 inch.

2.2 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A 615M Grade 40 (280); deformed billet steel bars; unfinished finish.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A185/A185M; in flat sheets; unfinished.
- C. Dowels: ASTM A615/A615M Grade 40 (280); deformed billet steel bars; unfinished finish.

2.3 CONCRETE MATERIALS

- A. Concrete Materials: As specified in Section 033000.

2.4 ACCESSORIES

- A. Joint Sealant: Type F as specified in Section 079200.

2.5 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- C. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 - 2. Slag 50% Maximum pound for pound cement replacement.
 - 3. Check with concrete provider for information on amount of curing time required.
 - 4. Use recycled aggregates as available.
 - 5. Cement Content: Minimum 564 lb per cubic yard.
 - 6. Water-Cement Ratio: Maximum 40 percent by weight.
 - 7. Total Air Content: 4 to 6 percent, determined in accordance with ASTM C173/C173M.
 - 8. Maximum Slump: 3 inches.

2.6 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.2 AGGREGATE BASE COURSES

- A. Provide Aggregate Base materials conforming to ASTM D 2940 and Section 321123 – Aggregate Base Courses.
- B. Prepare subbase in accordance with State of Highways standards and Section 321123 – Aggregate Base Courses.

3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.5 REINFORCEMENT

- A. Place reinforcement at top of slabs-on-grade.
- B. Interrupt reinforcement at contraction joints.
- C. Place dowels to achieve pavement and curb alignment as detailed.

3.6 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.7 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints.

3.8 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components.
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
 - 2. Secure to resist movement by wet concrete.
- C. Provide scored control joints at 5 feet intervals. Control joints shall be tooled, not sawn.

3.9 FINISHING

- A. Area Paving: Light broom, texture perpendicular to pavement direction.
- B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.
- C. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- D. Inclined Vehicular Ramps: Broomed perpendicular to slope.

3.10 JOINT SEALING

- A. See Section 079200 for joint sealant requirements.

3.11 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design to testing firm for review prior to commencement of concrete operations.
- B. Compressive Strength Tests: ASTM C39/C39M.
 - 1. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of concrete placed.
 - 2. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.13 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit vehicular traffic over pavement for 7 days minimum after finishing.

3.14 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

END OF SECTION

CHASE
SECTION 321413 – UNIT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete Pavers
- B. Joint Sand
- C. Setting Bed Sand
- D. Base and Subbase Aggregates
- E. Geotextiles
- F. Edge restraints
- G. Cleaners and Sealers

1.2 RELATED SECTIONS

- A. 033000 – Cast In Place Concrete
- B. 321123 – Aggregate Base Courses
- C. 321313 – Portland Cement Concrete Paving

1.3 REFERENCES

- A. ASTM International, latest edition:
 - 1. C 33, Standard Specification for Concrete Aggregates.
 - 2. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
 - 3. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 4. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 5. C 144 Standard Specifications for Aggregate for Masonry Mortar.
 - 6. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - 7. C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
 - 8. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
 - 9. D 698 Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5 lb (24.4 N) Rammer and 12 in. (305 mm) drop.
 - 10. Only for projects including geotextiles:
 - a. D 5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
 - b. D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - c. D 4533, Standard Test Method for Index Trapezoidal Tearing Strength of Geotextiles
 - d. D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
 - e. D 4491, Standard Test Method for Water Permeability of Geotextiles by Permittivity
 - f. D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - g. D 4354, Standard Practice for Sampling of Geosynthetics for Testing
 - h. D 4759, Standard Practice for Determining the Specifications Conformance of Geosynthetics

1.4 SUBMITTALS

- A. Submittal procedures and documents
 - 1. See Section 013000 for submittal procedures.
 - 2. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
 - 3. Test results from an independent testing laboratory for compliance:
 - a. Pavers: ASTM C 936.
 - b. Joint and setting bed sand: sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.
 - c. Base and Subbase Aggregate: sieve analysis per ASTM C 136.

CHASE
SECTION 321413 – UNIT PAVING

4. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- B. Product samples
1. Pavers: three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
 2. Joint Sand: three representative one pound samples in containers.

1.5 QUALITY ASSURANCE

- A. Utilize a Manufacturer having at least ten years of experience manufacturing concrete pavers on projects of similar nature or project size.
- B. Source Limitations:
1. Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
 2. Obtain Joint and Setting Bed Sands from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Paving Contractor Qualifications:
1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
- D. Mockups:
1. Install a 5 ft x 5 ft paver area per each paving pattern.
 2. Use this area to determine surcharge of the Setting Bed Sand layer, joint sizes, lines, laying pattern(s) and levelness. This area will serve as the standard by which the workmanship will be judged.
 3. Subject to acceptance by owner, mock-up may be retained as part of finished work.
 4. If mock-up is not retained, remove and dispose legally.

1.6 DELIVERY, STORAGE & HANDLING

- A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.
- B. Deliver Concrete Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
 2. Deliver Concrete Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload Concrete Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.
- C. Store and protect materials free from mud, dirt and other foreign materials.
- D. Prevent Joint and Setting Bed Sand from exposure to rainfall or removal by wind with secure, waterproof covering.

1.7 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
1. Install Concrete Pavers only on unfrozen and dry Setting Bed Sand.
 2. Install Setting Bed Sand only on unfrozen and dry Base or Subbase Aggregate materials.
 3. Install Aggregate Base Courses only over unfrozen subgrade.
 4. Install Setting Bed Sand or Concrete Pavers when no heavy rain or snowfall are forecast within 24 hours.

1.8 CONCRETE PAVER OVERAGE AND ATTIC STOCK

- A. Provide a minimum of 5% additional material for overage to be used during construction.
- B. Manufacturer to supply maintenance and reinstatement manuals for Concrete Paver units.

CHASE
SECTION 321413 – UNIT PAVING

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- A. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
- B. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
- C. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
- D. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.
- E. Accept only pigments in concrete pavers conforming to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.
- F. Basis-of-Design Product: The Concrete Paver shapes are based on: Unilock: [Courtstone / Copthorne / Richcliff / Belpasso / Umbriano / Series 3000 / IL Campo / Holland Premier].
Unilock (Add location), Address, City, State and Zip
Contact: [insert Unilock representative name and phone number]
<https://www.unilock.com>
- G. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
 - 1. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.
- H. Concrete Paver Type 1: [product manufacturer and name]
 - 1. Color: []
 - 2. Finish: []
 - 3. Edge: []
 - 4. Size: []. Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.

2.2 JOINT SAND

- 1. Provide natural Joint Sand as follows:
- 2. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
- 3. Do not use limestone screenings, stone dust, or sand for the Joint Sand material that does not conform to the grading requirements of ASTM C 144.
- 4. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.

2.3 SETTING BED SAND

- A. Provide Setting Bed Sand as follows:
 - 1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
 - 2. Do not use limestone screenings, stone dust, or sand material that does not conform to the grading requirements of ASTM C 33.
 - 3. Do not use mason sand or sand conforming to ASTM C 144.
 - 4. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.

2.4 AGGREGATE BASE COURSES

- A. Provide Aggregate Base materials conforming to ASTM D 2940 and installed per Section 321123 – Aggregate Base Courses.

2.5 SUBBASE

- A. Provide Subbase aggregate as designed per the structural or civil engineer.

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2.6 GEOTEXTILE

- A. Provide geotextile material conforming to the following performance characteristics, measured per the test methods referenced:
 - 1. 4 oz., nonwoven needle punched geotextile composed of 100% polypropylene staple fibers that are inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.
 - 2. Grab Tensile Strength: ASTM D 4632: 115 lbs.
 - 3. Grab Tensile Elongation: ASTM D 4632: 50%
 - 4. Trapezoidal Tear: ASTM D4533: 50 lbs.
 - 5. Puncture: ASTM D4833: 65 lbs.
 - 6. Apparent Opening Size: ASTM D 4751: 0.212 mm, 70 U.S. Sieve
 - 7. Permittivity: ASTM D 4491: 2.0 sec -1
 - 8. Flow Rate: ASTM D 4491: 140 gal/min/s.f.
- B. As supplied by [Unilock].

2.7 EDGE RESTRAINTS

- A. The provision of suitable edge restraints is critical to the satisfactory performance of interlocking concrete block pavement. Abut pavers tightly against the restraints to prevent rotation under load and any consequent spreading of joints. Install sufficiently stable edge restraints that are, in addition to providing suitable edge support for the paver units, able to withstand the impact of temperature changes, vehicular traffic and/or snow removal equipment.
- B. Curbs, gutters or curbed gutter, constructed to the dimensions of municipal standards (noting that these standards generally refer to cast-in-place concrete sections), are considered to be acceptable edge restraints for heavy duty installations. Where extremely heavy industrial equipment is involved such as container handling equipment, review the flexural strength of the edge restraint carefully particularly if a section that is flush with the surface is used and may be subjected to high point loading.
- C. Concrete Edge Restraint as indicated in drawings.
- D. Plastic and Metal Edge Restraints, including accessories as required:
 - 1. Pave Tech
 - a. Material Type: Plastic
 - b. Model No.: Pave Edge Rigid, Pave Edge Flexible, Pave Edge Industrial
 - 2. Snap Edge
 - a. Material Type: Plastic
 - b. Model No.: One Piece Edging, 96 inches
 - 3. Permaloc
 - a. Material Type: Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Concrete Pavers.
- B. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
- C. Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
- D. Verify that the Base and Subbase Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
- E. Provide written density test results for soil subgrade, Base and Subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
- F. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

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SECTION 321413 – UNIT PAVING

- H. Beginning of Bedding Sand and Concrete Paver installation signifies acceptance of Base and edge restraints.

3.2 PREPARATION

- A. Verify that the subgrade soil is free from standing water.
- B. Stockpile Setting Bed Sand, Joint Sand, Base and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Geotextile and Subbase Aggregate materials.
- D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Joint Sand, Setting Bed Sand, Base and Subbase Aggregate materials contaminated with sediment with clean materials.
- E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Base or Subbase Aggregate construction.
- F. Prevent damage to underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.
- G. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D 1557 for vehicular areas. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.
- H. Backfill all service trenches within the pavement area to the sub-grade level with approved material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D 698.
- I. Trim the subgrade to within 0 to ½ in. (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.
- J. Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with compacted backfill or fill as directed.
- K. Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected by the Architect/Engineer.
- L. Base compaction of the subgrade soil on the recommendations of the Design Engineer. Request the Architect/Engineer to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.
- M. Mechanical tampers (jumping jacks) are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. Compact areas, not accessible to roller compaction equipment, to the specified density with mechanical tampers. CAUTION – Proceed with care around the perimeters of excavations, buildings, curbs, etc. These areas are especially prone to consolidation and settlement. Do not place wedges of backfill in these areas. If possible particularly in these areas, proceed with backfilling and compacting in shallow lifts, parallel to the finished surface.

3.3 INSTALLATION

- A. **EDGE RESTRAINTS**
 - 1. Provide concrete edge restraints as indicated.
 - 2. Install job-built concrete edge restraints to comply with requirements in Division 3 Section "Cast-in-Place Concrete."
 - 3. Provide concrete edge restraint along the perimeter of all paving as indicated. Install the face of the concrete edge restraint, where it abuts pavers vertical down to the subbase.
 - 4. Construct concrete edge restraint to dimensions and level specified and support on a compacted subbase not less than 6 in (150 mm) thick.

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5. Provide plastic or metal edge restraints as indicated and supported on a minimum of 6 inches (150 mm) of Base Aggregate. Provide 10" spiral galvanized or stainless steel spike to fasten plastic edge restraint at 24 inches on center for straight sections and 12 inches on center for curved sections.
- B. GEOTEXTILES (when specified)
1. Provide separation geotextile on bottom and sides of prepared soil subgrade. Secure in place to prevent wrinkling or folding from equipment tires and tracks.
 2. Overlap ends and edges a minimum of 18 in. (450 mm) in the direction of drainage.
- C. BASE AND SUBBASE AGGREGATE
1. Provide the Subbase Aggregate in uniform lifts not exceeding 6 in., (150 mm) loose thickness and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.
 2. Compact the Subbase Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
 3. Tolerance: Do not exceed the specified surface grade of the compacted Subbase Aggregate material more than $\pm 3/4$ in. (20 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
 4. Provide the Base Aggregate material in uniform lifts not exceeding 6 in. (150 mm) over the compacted Subbase Aggregate (or Subgrade) material and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.
 5. Compact the Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
 6. Tolerance: Do not exceed the specified surface grade of the compacted Base Aggregate material more than $\pm 3/8$ in. (10 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
 7. Compact and grade the upper surface of the base sufficiently to prevent infiltration of the bedding sand into the base both during construction and throughout its service life. Blend segregated areas of the granular base by the application of crushed fines that have been watered and compacted into the surface.
- D. SETTING BED SAND
1. Provide and spread Setting Bed Sand evenly over the Base Aggregate course and screed to a nominal thickness of 1 in. (25 mm).
 2. Protect screeded Setting Bed Sand from being disturbed by either pedestrian or vehicular traffic.
 3. Screed only the area which can be covered by pavers in one day.
 4. Do not use Setting Bed Sand material to fill depressions greater in the base surface.
 5. Keep moisture content constant and density loose and constant until Concrete Pavers are set and compacted.
 6. Screed the Setting Bed Sand using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards.
 7. Carefully maintain spread Setting Bed Sand in a loose condition, and protected against incidental compaction, both prior to and following screeding. Loosen any incidentally compacted sand or screeded sand left overnight before further paving units are placed.
 8. Provide lightly screeded Setting Bed Sand in a loose condition to the predetermined depth, only slightly ahead of the paving units.
 9. Fully protect screed Setting Bed Sand against incidental compaction, including compaction by rain. Remove any screeded Setting Bed Sand that is incidentally compacted prior to laying of the paving units.
 10. Inspect the Setting Bed Sand course prior to commencing the placement of the Concrete Pavers. Acceptance of the Setting Bed Sand occurs with the initiation of Concrete Paver placement.
- E. CONCRETE PAVERS
1. Replace Concrete Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
 2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most

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- commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).
3. Exercise care in handling face mix concrete pavers to prevent surfaces from contacting backs or edges of other units.
 4. Provide Concrete Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.
 5. Use string lines or chalk lines on Setting Bed Sand to hold all pattern lines true.
 6. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
 7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
 8. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
 9. Prevent joint (bond) lines from shifting more than $\pm 1/2$ in. (± 13 mm) over 50 ft. (15 m) from string lines.
 10. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
 11. Cut Concrete Pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 12. Prevent all traffic on installed Concrete Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Concrete Pavers that have not received initial compaction and Joint Sand material.
 13. Vibrate Concrete Pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
 - a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
 - b. Compact installed Concrete Pavers to within 6 feet (2 meters) of the laying face before ending each day's work. Cover Concrete Pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Setting Bed Sand from becoming disturbed.
 14. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
 15. Remove any cracked or structurally damaged Concrete Pavers and replace with new units prior to installing Joint Sand material.

F. JOINT SAND

1. Provide, spread and sweep dry Joint Sand into joints immediately after vibrating pavers into Setting Bed Sand course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
2. Leave all work to within 3 ft. (1 m) of the laying face fully compacted with sand-filled joints at the completion of each day.
3. Remove excess Joint Sand broom clean from surface when installation is complete.

3.4 FIELD QUALITY CONTROL

- A. Verify final elevations for conformance to the drawings after sweeping the surface clean. Prevent final Concrete Paver finished grade elevations from deviating more than $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.
- B. Lippage: No greater than 1/32 in. (0.8 mm) difference in height between Concrete Pavers and adjacent paved surfaces.

3.5 REPAIRING, CLEANING AND SEALING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

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- B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean. Clean Concrete Pavers in accordance with the manufacturer's written recommendations.

3.6 PROTECTION

- A. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION

CHASE
SECTION 321716 – TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cast-in-place cast iron detectable warning tiles.
- B. Surface-applied polymer composite / fiberglass detectable warning tiles.

1.2 RELATED SECTIONS

- A. 033000 – Cast In Place Concrete
- B. 079200 – Joint Sealants.
- C. 321313 – Portland Cement Concrete Paving

1.3 REFERENCES

- A. Americans With Disabilities Act (ADA) documents:
 - 1. *ADA Standards for Accessible Design – 2010* (9/05/11, DOJ).
 - 2. *ADA Accessibility Guide (ADAAG)*: Sections 705 and 810.
- B. *Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way*; US Access Board; 7/23/2011; sections R208, R304, R305, R308, and R309; published as 36 CFR Part 1190.
- C. California Code of Regulations (CCR 2007) Title 24 Part 1 Articles 2, 3 and 4, and Part 2 Section 205 definition of “Detectable Warning”, Section 1127B.5 for “Curb Ramps”, and Section 1133B.8.5 for “Detectable Warnings at Hazardous Vehicle Areas”. California Department of Transportation Detectable Warning Surface Authorized Material List. Division of the State Architect IR 11B-3 (1/26/05) and IR 11B-4 (1/01/11). IR 11B-4 (1/01/11) removed the requirement for a “staggered” pattern and now calls for the “square grid” (in-line) pattern.
- D. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M105 – *Standard Specification for Gray Iron Castings*; current edition.
- E. AASHTO HM-35 – *Standard Specifications for Transportation Materials and Methods of Sampling and Testing*; current edition.
- F. American Society for Testing and Materials (ASTM)
 - 1. ASTM A48 / A48M - *Standard Specification for Gray Iron Castings*; latest edition.
 - 2. Test Methods B117, C501, C1028, D543, D570, D638, D695, D790, G151, G155, and E84; latest editions.
- G. American Concrete Institute (ACI)
 - 1. ACI 530.1/ASCE 6/TMS 602

1.4 ACTION SUBMITTALS

- A. Product data: For each type of product, submit manufacturer's literature describing products.
- B. Material test reports: Submit current test reports from qualified, accredited independent testing laboratory in accordance with ASTM guidelines and indicating that materials proposed for use are in compliance with specification requirements and the meet properties indicated.
- C. Samples for verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.
- D. Jurisdictional approvals as applicable.
- E. Installer references: Provide written contact information for the general contractor or property owner for a minimum of five previous projects.
- F. Installer certification: For each type of tactile warning surface, provide manufacturer's written certification indicating installer's qualifications.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty documents.
- B. Maintenance Instructions: Include copies of manufacturer's specified maintenance practices for each type of tactile warning surface tiles and accessories.

1.6 WARRANTY

- A. Manufacturer minimum warranty: 5 years. Manufacturer agrees to provide replacement components of tactile warning surfaces with failures including, but not limited to, manufacturing defects, breakage, deformation, deterioration of finishes beyond normal weathering and wear, and separation or delamination of materials and components.
- B. Installer minimum warranty: 1 year. Installer agrees to repair or replace components of tactile warning surfaces with, breakage, deformation, or release from substrate (either wholly or partially) due to adhesive or fastener failure or other installation defect.

1.7 QUALITY ASSURANCE

- A. Each type of product of this Section shall be sourced from a single manufacturer, and installed by a single vendor.
- B. Manufacturer: Company specializing in manufacture of products of this Section for a minimum of ten years.
- C. Installer Qualifications: Experienced installer, certified in writing by tactile warning surface manufacturer, who has successfully completed tactile warning surface installations similar in material, design, and extent at a minimum of five previous projects.

1.8 DELIVERY, STORAGE AND HANDLING

- A. All materials shall be delivered to the site and stored in the manufacturer's original, labelled packaging.
- B. Upon receipt of panels and other materials, installer shall examine the shipment for damage and completeness.
- C. Materials should be stored in a clean, dry location, out of direct sunlight. One end should be elevated to allow moisture to run off. Stack all materials to prevent damage and to allow for adequate ventilation.

1.9 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) or higher.
 - 3. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set unit pavers within 1 minute of spreading setting-bed mortar.

PART 2 - PRODUCTS**2.1 TACTILE WARNING SURFACING, GENERAL**

- A. Accessibility Requirements: Comply with applicable provisions in *2010 ADA Standards for Accessible Design* for tactile warning surfaces.

1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

2.2 DETECTABLE WARNING TILES

- A. Cast-in-place metal detectable warning tiles: accessible truncated-dome detectable warning metal tiles configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
 1. Manufacturers, products
 - a. Basis-of-Design Product: EJ USA, Inc.; www.ejco.com; Duralast series.
 - b. Neenah Foundry; www.nfco.com; Detectable Warning Plates, 4984 series.
 - c. Deeter Foundry; www.deeter.com; Detectable Warning Plates, 4984 series.
 - d. TufTile, Inc.; www.tuftile.com; Wet-Set Cast Iron (Replaceable) Tiles.
 - e. Substitutions: refer to Section 016000.
 2. Material: cast iron: gray iron, ASTM A 48/A 48M, CL 35.
 3. Finish and color: Uncoated, natural finish.
 4. Shapes and sizes
 - a. Provide tiles in the largest consistent sizes available from any given manufacturer.
 - b. Provide radiused tiles to match radiused curbs.
 - c. Truncated dome spacing and configuration: Center to center spacing shall be manufacturer's standard compliant spacing, 1.4" minimum and 2.4" maximum.
 5. Mounting: permanently embedded detectable warning tile wet-set into freshly poured concrete.
- B. Surface-applied detectable warning tiles (RETROFIT CONDITIONS AT EXISTING SITES ONLY): accessible truncated-dome detectable warning tiles configured for surface application on existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of tile, and beveled outside edges.
 1. Manufacturers, products
 - a. TufTile, Inc.; www.tuftile.com; Surface Applied (Replaceable) Polymer Tiles.
 - b. Armorcast Products Company; www.armorcastprod.com;
 - c. Engineered Plastics Inc.; Armor-Tile.
 - d. Substitutions: refer to Section 016000.
 2. Color: Safety yellow.
 3. Shapes and Sizes:
 - a. Rectangular panel, 24 by 24 inches (610 by 610 mm).
 - b. Radius panel, nominal 24 inches (610 mm) deep, radius as required to match site conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine delivered tactile warning plates to verify correct size, attachment type, surface texture and finish prior to placing concrete.
- B. Inspect individual units to ensure they are undamaged prior to installation.
- C. Clean the underside of units free of loose debris and all organic material.

3.2 INSTALLATION

- A. For installations with multiple adjacent plates, connect plates together using the manufacturer's hardware if required, or hardware as otherwise specified.
- B. Place the concrete slab, with required slopes, only after tactile warning plates are prepared for setting.
- C. Use supplied lifting springs and a construction 2x4 or pipe to lift plates into position.
- D. Set plates in wet concrete at final position. Do not reposition plates in-place, in order to avoid voids in the concrete below the plates. If repositioning is required, fully remove the plates from the wet concrete, re-level the slab, and re-set the plates.
- E. Remove lifting springs.

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SECTION 321716 – TACTILE WARNING SURFACING

- F. Press assembly into wet concrete to final elevation.
- G. Finish concrete around assembly
- H. Remove any wet concrete that may have spilled on to the plate surface.
- I. Refer to section 033000 – Cast-In-Place Concrete for slab curing procedures.

3.3 CLEANING

- A. Remove all scrap and construction debris from the site.

3.4 PROTECTION

- A. Protect finished work under provisions of Section 017000.
- B. Do not permit traffic over plates until underlying slab is capable of supporting traffic without damage.

END OF SECTION

CHASE
SECTION 323124 - VINYL FENCE AND GATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Vinyl fence and gates manufactured with mono-extruded profiles from 100 percent virgin PVC compound.

1.2 RELATED SECTIONS

- A. 033000 – Cast-in-Place Concrete.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - 2. D638 - Standard Test Method for Tensile Properties of Plastics.
 - 3. D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - 4. D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 - 5. D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30°C and 30°C With a Vitreous Silica Dilatometer.
 - 6. D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.
 - 7. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 8. D4226 - Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products.
 - 9. F964 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior Profiles Used for Fencing and Railing.

1.4 DEFINITIONS

- A. Mono-extruded profile: A profile manufactured with a consistent layer of one material throughout the product.

1.5 SUBMITTALS

- A. Reference Section 013000 - Administrative Requirements for submittal procedures; submit following items:
 - 1. Product Data.
 - 2. Shop Drawings:
 - a. Manufacturer's typical detail and assembly drawings including post anchorage details.
 - b. Dimensioned plan showing fence location relative to property lines, location of gates, gate swing, and details of post anchorage.
 - c. Note proposed changes from plans and details shown on Drawings.
 - 3. Samples:
 - a. Provide minimum 12 inch long sample of each PVC profile used in the fence system. Include post cap and picket cap.
 - b. Provide PVC sample of available colors.
 - 4. Quality Assurance/Control Submittals:
 - a. Qualifications: Proof of manufacturer's qualifications.
 - b. Manufacturer's Installation Instructions.
- B. Closeout Submittals: Reference Section 017800 submit following items:
 - 1. Maintenance Instructions.
 - 2. Special Warranties.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer Qualifications:
 - a. Minimum ten years experience in producing vinyl fence of the type specified.
 - b. Member American Fence Association.

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SECTION 323124 - VINYL FENCE AND GATES

- c. Member Vinyl Fence, Deck and Railing Manufacturers Association.
- d. Member International Code Council.
- e. Maintain Quality Control Manual in compliance with ICC AC 10.
- 2. Installer Qualifications: Manufacturer's approval.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Special Instructions:
 - 1. Store vinyl fence materials on clean flat surface.
 - 2. Do not stack more than 5 packs high.

1.8 WARRANTY

- A. Special Warranty: Non-prorated, non-transferable, 50 year limited warranty against defective raw materials and defects in manufacturing.
 - 1. Include warranty against color change due to normal atmospheric conditions that exceed the limits established by ASTM D4726.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Nebraska Plastics, Inc. (Cozad, NE 069130-0045 ; TEL (800)-445-2887) FAX (308) 784-3216
- B. Style: Country Estate Caribbean.
 - 1. Height: As shown on Drawings.

2.2 MATERIALS

- A. Posts, Rails, and Vertical Infill Members: Rigid PVC Homopolymer Compound:
 - 1. Manufacturer's standard mono-extruded PVC profiles. Comply with ASTM F 964.
 - 2. Physical Properties:
 - a. Impact Resistance, ASTM D 256: (ft lbs per inch notch)
 - 1) 23 degrees C – 5.0.
 - 2) 0 degrees C –2.0.
 - b. Tensile Strength, ASTM D 638: 6,500 psi.
 - c. Tensile Modulus, ASTM D 638: 545,000 psi.
 - d. Deflection Temperature, ASTM D 648: 71 degrees C.
 - e. Drop Dart Procedure A, ASTM D 4226: 2.51 in-lb per mil.
 - f. Drop Dart Procedure B, ASTM D 4226: 4.50 in-lb per mil.
 - g. Compressive Strength, ASTM D 695: 8,780 psi.
 - h. Thermal Expansion, ASTM D 696: 4.4 times 10⁻⁵ in per in per degree F.
 - i. Shear Strength, ASTM D 732: 6,780 psi.
 - j. Flexural Strength, ASTM D 790: 11,400 psi.
- B. Aluminum Post Inserts: Manufacturer's standard extruded aluminum profile.
- C. Aluminum Rail Insert Bars: Manufacturer's standard extruded aluminum profile.
- D. Hardware: Black powder coated, 14 gauge, type 304 stainless steel.
 - 1. Hinge and Latch Type: As shown on Drawings. Hinges shall be adjustable to maintain proper gate alignment.
 - 2. Cane Bolt. Provide on inactive leaf of double gates.
- E. Concrete: Reference Section 033000; 2,500 psi minimum.

2.3 COMPONENTS

- A. Posts:
 - 1. Line: 5" x 5" x .170".
 - 2. Corner or End: 5" x 5" x .170".
 - 3. Gate: Steel pipe (see details on drawings).
- B. Rails:
 - 1. Top: 2" x 7" x .090".

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- 2. Bottom: 2" x 7" x .090".
- C. Vertical Infill Member (Pickets or Panels): Tongue & Groove .875" x 7" x .070".
- D. PVC Gates: Match fence style and provide PVC diagonal bracing as recommended by manufacturer.
- 2.4 ACCESSORIES**
 - A. PVC Post Cap: Traditional (External Flange).
 - B. Provide manufacturer's standard brackets, fasteners, PVC grommets, and other accessories required to complete installation.
- 2.5 FINISH**
 - A. PVC Components and Accessories: Integral color – Gray.
 - B. Gate Hardware: Powder coated black.
- 2.6 SOURCE QUALITY CONTROL**
 - A. Manufacturer PVC profiles in accordance with ASTM F964. Test in accordance with manufacturer's Quality Control Manual.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine earthwork where fencing is to be installed.
 - 1. Verify that soil is either firm undisturbed or properly compacted at post locations.
 - 2. Verify property line locations, legal boundaries, and relative post placement.
- B. Coordinate with responsible entity to correct unsatisfactory conditions.
- C. Commencement of work by installer is acceptance of existing conditions.

3.2 PREPARATION

- A. Stake fence layout including posts and gates to be inside property lines. Note locations of underground utilities, irrigation systems, benchmarks, property monuments and other underground structures.

3.3 INSTALLATION

- A. Follow Country Estate Installation Guide except as modified herein.
- B. Post Setting:
 - 1. Spacing: 6 foot center to center except as otherwise shown on Drawings.
 - 2. Footing Depth and Type: As shown on Drawings.
 - 3. Set posts and fill post holes with concrete.
- C. Install specified fence components and accessories using the routed post/inserted rail method except where conditions require pocket mounted rails or where pocket mounted rails are shown on Drawings.

3.4 ADJUSTING

- A. Adjust gates and hardware to operate smoothly and latch securely.

3.5 CLEANING

- A. Clean fence in accordance with manufacturer's instructions.

END OF SECTION

CHASE
SECTION 323133 - CUSTOM GATE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fence framework, infill panels, and accessories.
- B. Manual gates and related hardware.

1.2 RELATED SECTIONS

- A. 033000 – Cast-in-Place Concrete: Concrete anchorage for posts.
- B. 042000 – Unit Masonry
- C. 055000 – Metal Fabrications

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.
 - 2. A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
 - 3. F567 - Standard Practice for Installation of Chain-Link Fence; 2000.
 - 4. F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2006.

1.4 SUBMITTALS

- A. Reference Section 016000 - Product Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Frames: Extruded Aluminum Alloy 6063-T52. Welded Tubing, Square Corners.
- B. Infill Panels: Extruded Aluminum – Flat Louvers

2.2 COMPONENTS

- A. Gate Frame: Aluminum Tubing, see Drawings.
- B. Panels: Aluminum Louvers

2.3 ACCESSORIES

- A. Hardware for Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp.

2.4 FINISHES

- A. Aluminum Gates: Shop Paint to match selected color.
- B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A 153M. Field or shop paint to match selected color.

PART 3 - EXECUTION

3.1 DESIGN AND INSTALLATION

- A. Design gate frame to prevent sag and deformation for heavy duty use.
- B. Provide reinforcements welded to frame for all attachment points as required.
- C. Provide all masonry embedment to align with gate attachment point.
- D. Provide separation pads at all dissimilar materials to prevent galvanic action.

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SECTION 323133 - CUSTOM GATE

E. Install gates plumb and true.

END OF SECTION

PART 1 - GENERAL**1.1 PERFORMANCE REQUIREMENTS**

- A. Irrigation controller shall be a Weathermatic “SmartLine” Controller utilizing a daily calculation from the Hargreaves ET formula to maximize water savings and provide healthy plant material sustainability.
- B. The Point-of-Connection shall utilize a master valve and flow sensor to shut down high flow events and to protect the property from damage and save water in the event that there is a break in the irrigation mainline.

1.2 SUSTAINABILITY REQUIREMENTS

- A. Provide the following as part of the irrigation system design and installation:
 - 1. Calculate estimated water use goals based on geographic location and plant type. Estimate to be completed prior to installation using Weathermatic calculation tools.
 - 2. Weathermatic Sustainability Services shall be responsible for site inspection to review installation according to specification and provide periodic site inspection to monitor system efficiency including recommendations of repairs and verification of prior repairs.
 - 3. Weathermatic Sustainability Services shall train irrigation contractor and Owner's property manager on installed equipment and proper standards for repair and maintenance.

1.3 AUTOMATIC CONTROL VALVES

- A. Plastic, Automatic Control Valves, molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-VAC solenoid.
 - 1. CONSTRUCTION: Contamination resistant remote control valves shall be MAX-DW Black Bullet as manufactured by Weathermatic Sprinkler Division of Telsco Industries, with hand operated manual internal bleed and flow control. Valve shall be solenoid-operated, diaphragm, reverse flow globe type, with 220 psi CWP rating, having NPT threads (1-inch, 1-1/2-inch and 2-inch) (optional ISO) and be suitable for underground burial without protection.
 - 2. Valve shall have glass-filled, high strength plastic body and cover with stainless steel spring. Cover shall be secured to body with stainless steel cover bolts having mating brass body inserts. Diaphragm shall be chlorine/ chloramine resistant, molded material with seat to form an integral unit.
 - 3. OPERATION: Solenoid shall be energized to open the valve hydraulically and de-energized to close. Pressure to the hydraulic chamber shall be supplied internally through non-metallic, corrosion-free orifices in the diaphragm with stroke of diaphragm causing a cleansing action of the orifices. There shall be no screens, filters, or strainers that can “clog up” and cause the valve to fail in the open position. There shall be no external bleeding or external tubing to furnish actuating pressure.
 - 4. WARRANTY: Valve shall have a manufacturer's warranty of five (5) years.

1.4 PRESSURE REGULATING DRIP CONTROL ZONE KIT

- A. Pressure Regulating Drip Control Zone Kit shall be model SCZ-MAX-DW-10 as manufactured by Weathermatic Sprinkler Division of Telsco Industries.
 - 1. CONSTRUCTION: Pressure regulating drip control zones shall be pre-assembled units including a remote control valve, wye filter and pressure regulator. Remote control valve shall be model MAX-DW-10 with 1" NPT (ISO) inlet and outlet threads and standard flow adjustment. Valve body shall glass-filled, high strength plastic body and cover with stainless steel spring and have a pressure activated diaphragm seal to resist leaks between the body and bonnet under high static and operating pressures. Remote control valve shall have a manual internal bleed lever on the downstream side of the valve capable of operating the valve without adjustment to the solenoid assembly and without leaking or flooding water in the valve box. Valve shall be reverse flow in design causing automatic closure in the event of diaphragm failure.
 - 2. Wye filter shall include a standard 150 mesh stainless steel filter and ¾" hose end male threaded outlet and cap. Optional 200 mesh stainless steel filter screens shall be available from the manufacturer and the filter unit shall be capable of upgrade to the Spintech vortex filter for dirty water applications for extending the service life of the filter and eliminating flow restriction and pressure loss through the filter assembly.

3. The pressure regulator shall be constructed of high-impact engineering glade plastics using a tamper-proof housing design that will deliver a constant outlet pressure over a wide range of inlet pressures with low friction loss. Standard outlet pressure for the regulator assembly shall be 25 psi (1,73 bar)
4. OPERATION: Pressure regulating drip control zones shall be solenoid or manually actuated. Solenoid actuator shall require 9.48 VA inrush current and 5.11 VA holding current at 24VAC/60 Hz. Inrush and holding current at 24VAC/50Hz shall be 10.66 VA and 5.97VA. Control zone shall a minimum and maximum flow range of 1-20 gpm. Maximum operating pressure shall not exceed 150 psi. Control zone shall deliver a constant outlet pressure of 25 psi (1,73 bar) over an inlet pressure range of 25-100 psi.
5. WARRANTY: Drip control zone assemblies have a manufacturer's limited warranty of two (2) years.

1.5 CONTROLLERS

- A. Controller(s) shall be SmartLine Controller(s), models SL1600 or SL4800 as manufactured by Weathermatic Sprinkler Division of Telsco Industries. Controller(s) shall be a four (4) program controller(s) with capability of 4 - 48 zones. The SL1600 will be 4 zones expandable by the addition of 4 zone modules to 16 zones. The SL4800 will have a base zone count of 12 zones expandable through the addition of 12 zone modules to 48 zones.
 1. Controller shall be capable of standard timed watering or auto adjust watering times when equipped with an optional SLW weather monitor manufactured by Weathermatic. Auto Adjust watering shall be based on real time, on-site weather data and system audit data entered by the user. Auto adjust timing shall be based on the Hargreaves ET calculation formula. Controller shall provide reviewable watering deficits, scheduled run times by zone and a total run time recap for each zone which is resettable by the user. A "more or less" function shall be provided to allow run time adjustment by zone for shade/sunlight, system efficiency and other local factors. Auto adjust mode shall also include automatic calculation of run/soak times based on both soil type and zone elevation.
 2. Each program shall have eight independent start times, calendar schedules, watering budgets by month and a soak/cycle for varying soil percolation rates.
 3. Controller shall have a pump start/master valve position, which shall be programmable to operate on demand from any selected zone. A programmable safety delay shall be included for zone to zone delay and master valve to zone delay for opening and closure.
 4. Controller shall have input for rain and freeze sensor devices selectable by zone. SLW weather monitor shall incorporate the rain and freeze shutdown functions and shall incorporate a 48-hour delay (adjustable 0 – 99 hours) after closure of the rain sense switch.
 5. Controller shall have self-diagnostic capabilities to detect "short" or "open" zones and the ability to display lists of faults on an LCD display for the user. Diagnostics shall also include LCD display of volt/amp readings by zone and for transformer output as well as backup battery reading. A chatter function shall also be provided to assist in locating buried valves. The controller shall automatically prevent master valve opening or pump start when the valve locator diagnostic is used.
 6. Controller display shall be backlit for clear viewing in all lighting conditions. Zone timing shall be settable from 1 minute to 9 hours and 55 minutes.
 7. Program D shall operate concurrently with programs A, B and C. Programs A, B and C shall stack in sequence of start time operation.
 8. Program schedules shall include options for days of the week, odd date, even date or an interval of 1 to 30 days. A 'no water' window shall be available to inhibit daily operations of a program between two selected times on a given day; omission of up to 15 specified calendar dates or specific days of the week. Adjustments for leap year shall be automatic.
 9. Manual operation shall be provided by program, by station, or on a programmable test program with durations from ten (10) seconds to ten (10) minutes. The programmable test program shall also check for short and open conditions on each zone each time it is run.
 10. A "non-volatile" memory shall retain all programming and real-time clock shall be provided to maintain date and time.
 11. Controller shall be capable of incorporating Weathermatic SmartLink Aircard allowing for web-based interface into controller to allow communications between SmartLink web site and controller.

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- B. Controller shall be enclosed in a U.L., CE and C-Mark Listed rainproof plastic enclosure with optional key lock. Enclosure shall be a wall mount (pedestal mount) model with removable knockouts on the lower side and back of the housing for choice of wiring location. The operating panel shall be a totally enclosed module that is removable from the housing for programming at a separate location. A test post for 24VAC operation shall be accessible with or without the operating panel.

- 1. Controller shall be completely electric in operation. Controller shall be installed and wired in accordance with manufacturer's instructions.

- C. Controller shall have a manufacturer's warranty of two (2) years.

1.6 WIRELESS LANDSCAPE NETWORK

- A. Wireless Landscape Network (SmartLink) shall be a custom model # SL-AIRCARD-CHASE as manufactured by Weathermatic Sprinkler Division of Telsco Industries. SL-AIRCARD-CHASE is comprised of the SL-AIRCARD and custom JP Morgan Chase SL-PLAN for cloud services. Optional package to be available with flow monitoring.
- B. SL-AIRCARD-CHASE shall be housed in an indoor/outdoor housing. It shall incorporate an L.E.D. visible externally to indicate operating conditions of the SL-AIRCARD. The SL-AIRCARD-CHASE shall be connected to the SmartLine Control, as manufactured by Weathermatic, through a cable from the SL-AIRCARD-CHASE terminating in the SmartLine Control with the use of a plug-in RJ11 connector.
- C. SL-AIRCARD-CHASE communications protocol will be cellular (either GSM or CDMA) allowing connection through secure web based servers to smartlinknetwork.com.
 - 1. SmartLink will not require software to be installed locally on a web-enabled appliance. Connection to SmartLink through the web shall be through a web-enabled appliance such as a PC, Smart Phone, Tablet, etc.
 - a. SmartLink will not require software to be installed locally on a web-enabled appliance.
 - b. User access to smartlinknetwork.com has password secured access to the user's account.
 - c. Security to the account with access to individual sites and controllers is defined by the account administrator.
 - d. Each account will have the capability of unlimited users, sites and controllers.
 - 2. At the controller page of the SmartLink web, the user will be able to review, change, or establish all programs available in the SmartLine Controller.
 - 3. User defined names for Sites, Controllers, and individual zones will be available.
 - 4. System/Controller/zone alerts will be sent to prescribed user by text or e-mail.
 - 5. SmartLink will be enabled with Global Commands for complete/partial system control.
 - 6. SmartLink will be enabled with AT-A-Glance Dashboard for easy review of SmartLine Controller parameters and manual watering operations.
- D. SL-AIRCARD-CHASE shall have a manufacturer's warranty of two (2) years.

1.7 WEATHER STATION

- A. Wireless weather station shall be model SLW5 manufactured by Weathermatic Sprinkler Division of Telsco Industries. Weather stations must be compatible for use with SmartLine irrigation controls.
 - 1. Weather station shall be wireless in design using bi-directional communication. Weather station shall have integrated on-site sensors for rain-shut off, freeze shut-off and calculation of daily evapotranspiration irrigation deficits. Weather station shall have an integral mounting bracket with a two-point articulating arm made from high-impact molded resin. Weather station shall be suitable for outdoor mounting in commercial or residential environments. Weather station shall be capable of two-way communications with the SmartLine controls and have independent power supply, self-diagnostic circuit and microprocessor.
- B. Weather station rain sensor shall be adjustable to interrupt irrigation after a user selected precipitation amount of 1/8 inch, 1/4 inch or 1/2 inch. Weather station shall be capable of interrupting irrigation after temperatures reach below 37 degrees Fahrenheit. Weather station shall provide instant notification to the controller of either a rain or freeze event and upon clearing of the same. Evapotranspiration deficits shall be calculated daily and transferred to the SmartLine controller each day.
- C. Weather station shall have a manufacturer's warranty of two (2) years.

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1.8 FLOW SENSOR

- A. Flow Sensor shall be model SLFSL-T or SLFSL-S manufactured by Weathermatic Sprinkler Division of Telsco Industries. The Model number shall include the Series designation followed by a three character group beginning with T (Tee Mounted) or S (Saddle Mounted) and followed by a two digit code referencing line size followed by a three digit electronic version designator. Therefore, the model number for a one inch size flow sensor with standard electronics would be written as: FSI-T10. Flow sensors must be compatible for use with SmartLine irrigation controls.
- B. The flow sensor shall be installed with a minimum of 10 diameters of straight pipe upstream, and a minimum of 5 diameters of straight pipe downstream to eliminate irregular flow profiles caused by valves, fittings or pipe bends.
- C. The flow sensor shall have an output Frequency Range of 0.3 Hz to 200 Hz.
- D. Flow sensors shall have a manufacturer's limited warranty of five (5) years.

1.9 SHORT RANGE ROTARY SPRINKLERS (ROTORS)

- A. ROTARY SPRINKLER HEAD(S) shall be the Turbo 3 (Options: N and/or -CV) as manufactured by Weathermatic Sprinkler Division of Telsco Industries, or approved equal. Sprinkler shall be a 4" pop-up type with positive gear drive for full-circle and part-circle coverage and 3/4" NPT riser connection.
 - 1. CONSTRUCTION: Head shall be made of high-strength, non-corrosive plastics and metals to ensure long-life performance. The sprinkler head shall have a sealed, lubricant-packed drive housing to assure long-life performance. Sprinkler head shall have a threaded screw-on cover and include a (Option: A Non-potable Alert) rubber cover. Sprinkler head shall utilize a double lip pressure activated wiper seal in conjunction with a stainless steel spring to assure positive head retraction. A slip clutch shall be included to protect gear train from damage. Reversing mechanism shall utilize an independent filtration system to prevent stalling. A check valve shall be provided to prevent low head drainage. Arc degree settings shall be clearly marked on adjustment ring to permit ease of adjustment.
 - 2. OPERATION: The arc adjustment ring on nozzle flow tube shall permit quick adjustment of arc size from 40 degrees to 360 degrees without the use of tools or the removal of the inner assembly. A set of field changeable nozzles shall be provided with each sprinkler to adapt performance to site conditions. The nozzle set shall include standard 26 degree trajectory and 13 degree low angle trajectory. Radius range shall be 23 to 61 feet. The sprinkler shall have an automatic adjusting stator to correctly match the flow required at the impeller with the nozzle selected and to regulate speed of rotation. Sprinkler shall momentarily dwell at the end of both arcs to provide uniform precipitation to border areas. Sprinkler head shall accept the vandal cover lock (XVT3) to lock cover to body.
 - 3. WARRANTY: The rotary sprinkler head shall have a manufacturer's limited warranty of not less than five (5) years.

1.10 MEDIUM RANGE ROTARY SPRINKLERS (ROTORS)

- A. ROTARY SPRINKLER HEAD(S) shall be the Turbo 35 (Options: N, SS and/or -CV) as manufactured by Weathermatic Sprinkler Division of Telsco Industries, or approved equal. Sprinkler shall be a 4" pop-up type with positive gear drive for full-circle and part-circle coverage and 1" NPT riser connection. Specify "-ISO" for International threads.
 - 1. CONSTRUCTION: Head shall be made of high-strength, non-corrosive plastics and metals to ensure long-life performance. The sleeve of the flow tube and nozzle Turret shall have (Option to be encased in stainless steel). The sprinkler head shall have a sealed, lubricant-packed drive housing to assure long-life performance. Sprinkler head shall have a threaded screw-on cover and include a (Option: A Non-potable Alert) rubber cover. Sprinkler head shall utilize a double lip pressure activated wiper seal in conjunction with a stainless steel spring to assure positive head retraction. A slip clutch shall be included to protect gear train from damage. Reversing mechanism shall utilize an independent filtration system to prevent stalling. A check valve shall be provided to prevent low head drainage. Arc degree settings shall be clearly marked on adjustment ring to permit ease of adjustment.
 - 2. OPERATION: The arc adjustment ring on nozzle flow tube shall permit quick adjustment of arc size from 40 degrees to 360 degrees without the use of tools or the removal of the inner assembly. A set of field changeable nozzles shall be provided with each sprinkler to adapt

performance to site conditions. The nozzle set shall include standard 26 degree trajectory and 13 degree low angle trajectory. Radius range shall be 23 to 61 feet. The sprinkler shall have an automatic adjusting stator to correctly match the flow required at the impeller with the nozzle selected and to regulate speed of rotation. Sprinkler shall momentarily dwell at the end of both arcs to provide uniform precipitation to border areas. Sprinkler head shall accept the vandal cover lock (XVT3) to lock cover to body.

3. WARRANTY: The rotary sprinkler head shall have a manufacturer's limited warranty of not less than five (5) years.

1.11 LONG RANGE ROTARY SPRINKLERS (ROTORS)

- A. ROTARY SPRINKLER HEAD(S) shall be the CT70 (Options: -N, -SS and/or -CV) as manufactured by Weathermatic Sprinkler Division of Telsco Industries, or approved equal. Sprinkler shall be a 4" pop-up type with positive gear drive for full-circle and part-circle coverage and 1" NPT riser connection (Optional ISO).
 1. CONSTRUCTION: Head shall be made of high-strength, non-corrosive plastics and metals to ensure long-life performance. The sleeve of the flow tube and nozzle Turret shall have (Option to be encased in stainless steel). The sprinkler head shall have a sealed, lubricant-packed drive housing to assure long-life performance.
 2. Sprinkler head shall have a threaded screw-on cover and include a (Option: A Non-potable Alert) rubber cover. Sprinkler head shall utilize a double lip pressure activated wiper seal in conjunction with a stainless steel spring to assure positive head retraction. A slip clutch shall be included to protect gear train from damage. Reversing mechanism shall utilize an independent filtration system to prevent stalling. A check valve shall be provided to prevent low head drainage. Arc degree settings shall be clearly marked on adjustment ring to permit ease of adjustment.
 3. OPERATION: The arc adjustment ring on nozzle flow tube shall permit quick adjustment of arc size from 40 degrees to 360 degrees without the use of tools or the removal of the inner assembly. A set of field changeable nozzles with a flow range of 8.1 to 28.0 GPM and a radius range of 49 to 74 feet, shall be provided with each sprinkler to adapt performance to site conditions. The sprinkler shall have an automatic adjusting stator to correctly match the flow required at the impeller with the nozzle selected and to regulate speed of rotation. Sprinkler shall momentarily dwell at the end of both arcs to provide uniform precipitation to border areas. Sprinkler head shall accept the vandal cover lock (XVT3) to lock cover to body.
 4. WARRANTY: The rotary sprinkler head shall have a manufacturer's limited warranty of not less than five (5) years.

1.12 SPRAYHEAD SPRINKLERS

- A. LAWN SPRAY HEAD shall be a MAX4, MAX6, MAX12 (Options: -CV, -PRS30 and/or -NP) as manufactured by Weathermatic Sprinkler Division of Telsco Industries, or approved equal. Heads shall pop up not less than 4, 6, or 12 inches with spring retraction. Heads shall accept a plastic matched precipitation rate nozzle, a fixed arc milled brass nozzle, or an adjustable plastic nozzle. Heads shall have ratcheted flow tube for arc location purposes and shall be check valve adaptable.
 1. CONSTRUCTION: Body, cover and flow tube shall be high-impact ABS. A stainless steel spring shall provide retraction force. Outside entry of sand and dirt shall be prevented with a pressure-activated wiper seal that provides for zero flow by at 5 psi or greater. 4, 6, 12 inch pop-ups shall be equipped with both side and bottom inlets. Arc location shall be by means of a positive stop-ratcheting device permitting the arc to be located by depressing flow tube while sprinkler is in operation. (Option -CV: The sprinkler shall be equipped with factory installed check valve and shall hold back 9.5 ft./hd. with a minimum pop up and seal pressure of 18 psi and/or a model MAX-NP purple, snap-on non-potable alert ring shall be provided on all installations requiring the use of non-potable water supplies and/or pressure regulating device to maintain a constant 30psi pressure rating within normal operating range of 30-70psi)
 2. OPERATION: The nozzles shall either provide adjustable flows and areas of coverage at rated pressure requirements in both full-circle and part-circle types or shall be fixed arc in both full and part circle types. All nozzles series must have matched precipitation to the extent that full and part circle nozzles can be valved together.
 3. WARRANTY: The MAX spray head shall have a manufacturer's limited warranty of not less than five (5) years.

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END OF SECTION

CHASE
SECTION 347100 – BOLLARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Plastic bollard covers.

1.2 RELATED SECTIONS

- A. 033000 – Cast-in-Place Concrete.
- B. 055000 – Metal Fabrications.

1.3 SUBMITTALS

- A. Submit under provisions of Section 013000 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

1.4 QUALITY ASSURANCE

- A. Manufacturers shall have been engaged in the production of specified products for not less than 5 years.
- B. Installer shall have documented experience installing this type of product on at least 5 prior projects of similar or greater scope.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store packaged materials under cover and out of direct sunlight.

1.6 PROJECT CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 WARRANTY

- A. Installer labor warranty shall be as indicated in Section 007200 – General Conditions or as supplemented or modified in section 007300 – Supplementary Conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Ideal Shield, 2525 Clark Street, Detroit, Michigan; www.idealshield.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 016000 - Product Requirements.

2.2 STEEL PIPE BOLLARDS

- A. Steel pipe: Type XS hot-dip galvanized steel pipe; nominal 4" and 6" diameter and length as indicated in the drawings steel. Refer to Section 055000 – Metal Fabrications.
- B. Concrete fill: Field-placed Normal Weight Concrete, mix and placement adjustments as required to ensure the absence of voids in the tube. Refer to Section 033000 – Cast-In-Place Concrete.

2.3 PLASTIC BOLLARD COVERS

- A. 1/4" thick thermoplastic polyethylene (HDPE) post sleeve with dome cap of 1/4" low-density polyethylene thermoplastic (LDPE).
- B. Color to match Benjamin Moore #2064-30 "Ol' Blue Eyes".

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- C. Length ordered or field-cut as required to cover steel tube bollards without exposing steel and with minimal height above steel.
- D. Diameter as required to fit steel pipe bollards snugly.
 - 1. 6" nominal steel pipe: Ideal Shield #BPD-OBE-6-XX, where XX = length in inches. Fits steel tubes with 6 5/8" O.D.
 - 2. 4" nominal steel pipe: Ideal Shield #BPD-OBE-4-XX, where XX = length in inches. Fits steel tubes with 4" – 4 1/2" O.D.
- E. Surface of sleeve to be smooth with round top, no ribbed or two piece systems accepted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to bollard cover installation, verify that the steel tubes were installed with proper position, size, height and visible installation detailing indicated in the drawings. Verify that all masonry, painting and sealant work adjacent to bollard locations are complete. Do not proceed with bollard cover installation until this work is completed. Where adjacent work is incomplete, installer is to stop work and notify the General Contractor.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide shims as required to eliminate bollard cover movement. If shimming is required, bollard covers shall be positioned tangent with the face of the island curb.
- C. Secure bollard cover to steel tube with manufacturer's neoprene adhesive tape. Do not use screws, glue or clamps.

3.4 PROTECTION

- A. Protect installed bollard covers until completion of project.
- B. Touch-up, repair or replace damaged bollard covers prior to the Date of Substantial Completion.

END OF SECTION